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No. 20

APPROPRIATIONS IN SUNDRY CIVIL ACT.

The sundry civil act, which has passed the house and is now under consideration in the senate, contains generous allowances for the light-house service and for improvements of harbors. Provision has been made for the continuance of numerous lake contracts. In all of its essential features the act will be passed by the senate as it now stands. Following are some of its provisions:

Continuing river and harbor improvements—For continuing improvement of harbor at Cleveland, \$175,000; for continuing improvement of Chicago river from its mouth to the stock yards on the South Branch, and to Belmont avenue on the North Branch, \$62,000; for continuing improvement of harbor at Duluth and Superior, \$793,187.50; for continuing improvement of water communication across Keweenaw point, \$110,000; for continuing improvements at Ashtabula Harbor, \$110,000; for improving Buffalo entrance to Erie basin and Black Rock harbor, New York, \$191,701.75; for continuing improvements at Black river, \$125,000; for continuing improvements on Detroit river, \$200,000; for continuing improvement Hay Lake channel, St. Mary's river, \$250,000; for completing improvement harbor of refuge, Milwaukee bay, \$105,650; for completing improvement of outer harbor at Michigan City, Ind., \$195,000; for completing improvement at Portage lake, Mich., \$85,000; for completing improvement of harbor at Racine, Wis., \$67,650; for continuing improvement of harbor at St. Joseph, Mich., \$253,950; for continuing improvements at Sand Beach, Mich., \$150,000; for completing improvement at Sheboygan, Wis., \$52,000; for continuing improvements at Toledo, \$132,500.

Light-house service—For completing a light ship and fog signal near Cape Elizabeth, Me., \$20,000; for removing Long Island head light station, Massachusetts, to a new site, \$4,500; for a new steam tender for the third light-house district, New York, \$62,500; for continuing the construction of sea wall at Staten Island light-house depot, New York, \$25,000; for a new steam tender for the fifth light-house district, \$20,000; for completing the removal of Cape San Blas light station, Alabama, \$65,000; for rebuilding Sand Island light and fog signal station, Sabine bank, Gulf of Mexico, \$50,000; for establishing a fog signal at Michigan City, Ind., \$5,500; for the construction of a steam tender for the ninth light-house district, Lake Michigan, \$50,000; for a light and fog signal station to mark the southern entrance of Buffalo harbor, \$45,000; for the purchase of land and erection of boat house on the mainland for the use of the keepers of Detroit river light station, mouth of Detroit river, \$1,000; for the construction of a large powerful seagoing tender for the thirteenth light-house district, \$120,000; for the establishment of a light and fog signal at Brown's point on Commencement bay in Puget sound, \$6,000; for constructing a new steam tender for the sixteenth light-house district, \$30,000; for general supplies for light-houses, \$475,000; for repairs to light-houses, \$625,000; for the lighting of rivers, \$300,000; for three superintendents of life saving stations on the great lakes, \$5,400.

Coast and geodetic survey—For surveys of the Pacific coast including the Hawaiian islands and Alaska, \$107,500; for continuing researches in physical hydrography, \$5,000; for off shore soundings and examination of reported dangers, \$10,100; for continuing magnetic observations, \$50,000; for repair and maintenance of vessels, \$29,600; for rebuilding and refitting the steamer Bache, to be immediately available, \$60,000; for all necessary employees to conduct the work, \$182,745.

Marine hospitals—For marine hospital improvements at Cleveland, \$5,000, marine hospital improvements at Detroit, \$3,000.

For general revenue cutter service, \$1,200,000.

For hydrographic service, \$12,000.

Circulars sent out recently by the United States Civil Service Commission indicate that ship masters or engineers aspiring to places on the local boards of the steamboat inspection service have an opportunity to secure such appointment. The circulars announce that there are vacancies on the eligible lists of both boiler inspectors and assistant hull inspectors. Examinations for these places will be held in all cities where local boards exist on June 19 and 20. The age limits are twenty-five to fifty-five years. The vacancy open for a boiler inspector is at Charleston, S. C., where the salary is \$1,500 a year; and for assistant inspector of hulls at Baltimore and New Orleans, with salary in each case of \$1,800 a year. Forms of application will be supplied by the United States Civil Service Commission, Washington, D. C.

Reports from blast furnaces throughout the United States show that on the first of the present month the capacity of the active furnaces had increased 4,368 tons weekly, as compared with the first of April. This increase took place notwithstanding a falling off of nearly 1,000 tons in the weekly capacity of the active charcoal furnaces, the coke furnaces turning out a heavier output. The increasing production of pig iron is attended with an increase in the stocks of pig iron carried at the furnaces. The increase in stocks of furnaces was 43,545 tons during the month. This is by no means a serious addition to furnace stocks, as the total stocks now held are quite small, but it is a significant manifestation of the falling off in the consumption of pig iron.

Within the past three months the various lake yards of the American Ship Building Co. (Consolidation) have launched twelve mammoth freight carrying steamers, including two 500-footers. These craft cost \$4,500,000, and their combined carrying capacity is 70,000 tons. There are now on the stocks in the yards of the company eleven more large craft, the combined carrying capacity of which is 60,000 tons; cost, \$4,000,000. Here are twenty-three new craft, with carrying capacity of 130,000 tons, costing \$8,500,000. In lake ship yards outside of the American company craft have been launched, or are almost ready, with capacity of 40,000 tons, making a total of new tonnage of the largest class of 170,000, and total valuation of about \$11,500,000.

CLERGUE'S LAND GRANTS FROM CANADA.

Francis J. Clergue of Sault Ste. Marie, Ont., who has become well known to lake shipping interests on account of the great water power development that he has undertaken on both the Canadian and American sides of the rapids of the St. Mary's river, has secured the passage of a bill in the Ontario legislature granting aid to the Algoma Central Railway, by means of which he proposes great development of mineral and timber lands in the Algoma district above Sault Ste. Marie, Ont. The bill grants 1,400 acres of land for every mile of the railway which may be constructed. The road is to run from Sault Ste. Marie almost due north to intersect the Canadian Pacific, and must throw off a branch to Michipicoton harbor, the total line being from 200 to 225 miles in length. The lands granted are to be in alternate blocks of 148,000 acres each. They are to be conveyed in fee simple to the company and shall include all ores, mines and minerals, as well as all standing timber. For the pine, however, the company shall have to pay whatever price the government gets for the pine on the alternate blocks not granted to the company. All nickel ore or combined ore of nickel and copper found on the lands is to be subject to such regulations as to treating or refining as may be applied to other lands of the province under any general law. None of the lands granted are to be nearer Sault Ste. Marie than twenty miles, nor nearer to Michipicoton harbor than ten miles. The following conditions are to be fulfilled in order that the company may be entitled to this grant:

1. The railway must be begun before June 1 next, and the whole road must be completed by May 1, 1903.

2. The Lake Superior Power Co. (one of Mr. Clergue's corporations at the Sault) must develop 40,000 horse power in addition to that already developed at their works; must begin within sixty days the construction of the canal or canals necessary for this increase, and must complete and equip the new power works in three years. Also the power company must begin within sixty days to construct smelting and reduction works of an ore capacity of 300 tons per day, and must complete them in two years. And the same company must within sixty days begin the erection of chemical works and complete the same in two years, such works to be of capacity to use 5,000 horse power for their operation.

3. The Sault Ste. Marie Pulp & Paper Co. (another of Mr. Clergue's companies) must erect a pulp mill additional to that now operated at Sault Ste. Marie, the new mill to have a daily capacity of fifty tons and to be completed within a year.

4. In the center of each of its blocks of land the Algoma Central Railway Co. must place a station, and shall erect a school house and public hall sufficient for the requirements of 500 people.

5. The railway company must establish within a year an immigration office in Toronto and another in Great Britain.

6. The railway company must carry into the country it traverses 1,000 male settlers each year for the next ten years, each of such male settlers to be not less than sixteen years old.

7. The railway company must establish a line of not less than four steel steamships for regular traffic between Michipicoton and Sault Ste. Marie, each vessel to be of not less than 2,000 tons capacity.

8. None of the pine or spruce on the company's lands shall be exported in the unmanufactured state.

FREIGHT SITUATION ON THE GREAT LAKES.

Although admitting that freight conditions thus far in the present season of navigation on the lakes are not what was expected, the vessel owners are not worried over the situation as they would have been if the proportion of vessels under contract were about what it has been in previous years. It is well understood, of course, that there never was a year when vessels were engaged on contracts as they are at present. This is why the so-called wild business will not be looked upon during any part of the season as the important factor that it has been in the past. On this score one of the vessel owners who is always closely in touch with the market says:

"The wild rate from the head of Lake Superior was announced as established at \$1.05, or 20 cents below the contract rate, but this was done by the charter of three small lumber boats, not regular ore carriers, and of a combined capacity of only 4,000 tons. Anything that has since been done in charters from the head of the lakes amounts to little more than this first transaction, and it is probable that wild charters from all the ore shipping ports since the opening of navigation would not cover more than 20,000 to 25,000 tons. This is a small item compared with the eighteen millions of contract tonnage. It must be admitted also that the ore movement has been greatly delayed by the fact that the shippers have been unable to provide for their contract vessels on account of slow working of steam-shovel mines. If the Rockefeller interest, as it is claimed, has the great bulk of surplus tonnage, such a condition is certainly to the advantage of all other vessel owners. It is far better to have this tonnage under one control than to have it distributed, especially as that one interest is strong enough to hold the vessels for satisfactory rates and to tie up, if necessary, the entire fleet. The result of a large amount of vessel capacity being tied up by that powerful interest will readily be understood."

The foregoing is the general tone of discussion regarding freights among the vessel men. The Bessemer company, which it has been admitted from the beginning holds the key to the situation, seems to keep its own council and thus there is little in the way of general interest in the market.

The absorption of the Baltimore, Chesapeake & Richmond Steamboat Co., or York River line, by the Chesapeake Steamship Co. of Baltimore, was completed last week. The Chesapeake Steamship Co. was incorporated on Jan. 25 with a capital stock of \$350,000 which latterly was increased to \$600,000.

WIRELESS TELEGRAPHY.

BY LIEUT. W. L. HOWARD, UNITED STATES NAVY, STAFF INTELLIGENCE OFFICER.

Ethereal telegraphy is by no means new, but now that it has become an established fact it has unquestionably a great field before it. Wireless telegraphy will not take the place of telegraphy with wire. Each has a special field of its own and under conditions which the other can not readily fulfill. In 1884 it was noticed that ordinary telegraphic messages sent through insulated wires buried in iron pipes under the streets of London were read upon telephone circuits erected upon poles carried above the housetops, in some instances over 80 feet away. Upon investigating this phenomenon Mr. W. H. Preece found in the following year that ordinary telegraphic circuits produced disturbances in instruments situated 2,000 feet away, and in 1886 and 1887 careful experiments showed that these effects were due to electro-magnetic wave currents, and were entirely free from earth conduction. In 1892 these experiments had advanced so far as to admit of distinct messages being sent across a portion of the Bristol channel, namely, between Penarth and Flatholm, a distance of 3.3 miles; but it was not until 1895 that anything practical was accomplished. In that year the cable between Oban and the Isle of Mull broke down, and as no ship was available for repairing the cable and restoring communication the expedient was adopted of establishing parallel wires on each side of the channel and transmitting signals across the space by electro-magnetic waves.

This brings us to the first of the two practical systems of ethereal telegraphy—the Preece system of induced currents over approximately horizontal and parallel wires. In this system two parallel circuits are established, as, for example, on each side of a channel or bank of a river, each circuit becoming successively the primary and secondary of an induction system, according to the direction in which the signals are being sent. Strong alternating or vibrating currents of electricity are transmitted in the first circuit so as to form signals, letters and words in Morse character. The effects of the rise and fall of these currents are transmitted as electro-magnetic waves through the intervening space, and if the secondary circuit is so situated as to be washed by these ethereal waves their energy is transformed into secondary currents in the second circuit, which can be made to effect a telephone and thus to reproduce the signals. Their intensity is much reduced, but their presence has been detected through five miles of clear space. The apparatus used in communicating between Oban and the Isle of Mull consisted of (see sketch) a rheotome, or make-and-break wheel, causing about 260 undulations per second in the primary wire; an ordinary battery of about 100 Leclanché cells, of the so-called dry and portable form; a Morse telegraph key; a telephone to act as receiver, and a switch to start and stop the rheotome. Good signals depend more on the rapid rise and fall of the

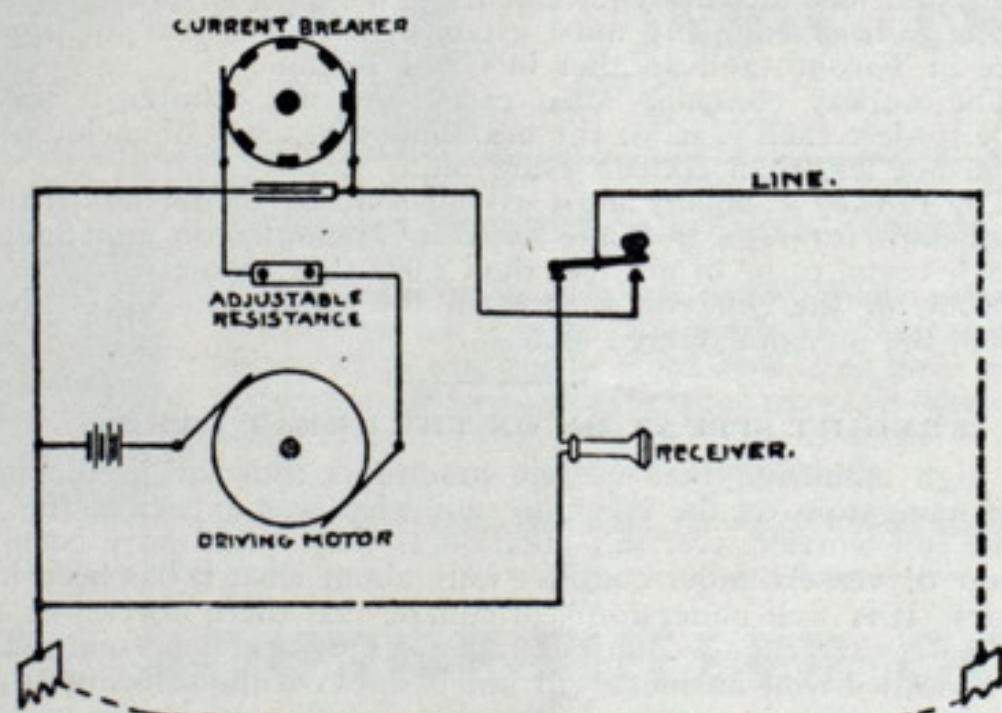


DIAGRAM OF CONNECTIONS OF MR. PRECEE'S SYSTEM

primary current than on the amount of energy thrown into vibration. Leclanché cells gave as good signals at 3.3 miles distance as $2\frac{1}{2}$ horse power transformed into alternating currents by an alternator. Two hundred and sixty vibrations per second give a pleasant note to the ear, easily read when broken up by the key into dots and dashes.

This system is at present in operation in the Bristol channel between the mainland and two small islands, Flatholm and Steepholm, distances of $3\frac{1}{2}$ and $4\frac{1}{2}$ miles, great lengths of wire being stretched parallel to each other along the islands and mainland. To communicate by this system there must be a length on each side of parallel wire equal to the distance to be bridged. It is the opinion of Prof. Oliver Lodge that no great distances can be attained by methods of simple induction, such as this, without the expenditure of an enormous and disproportionate amount of electric force and the use of great lengths of wire. He proposes and has conducted a series of successful experiments by which communication is established through "electrically similar" circuits. His account of his first experiments in Liverpool is as follows: "I have at my house a cable a quarter of a mile long altogether, inclosing an elongated rectangle, say 150 by 30 yards; and with that I can hear all that goes on in the neighboring telephone wires, and can even answer back with a suitable microphone transmitter, and can hear the signals when they are being sent to me from an equal length of cable round an equal but squarer contour at the Liverpool college, about two miles away." The important point here is that where, in Mr. Preece's induction experiments, the length of the parallel wires had roughly to be the same as that across which signals were sent, Dr. Lodge's syntonized circuits were only a quarter of that length and might have been still further reduced. Experiments along these lines are still in progress, the latest form being the use of vertical coils of wire instead of horizontal circuits.

THE MARCONI SYSTEM.

Dr. Heinrich Hertz, professor of physics in the University of Bonn, was the first to discover that high frequency electric waves could be propagated, reflected and deflected, while Mr. Edward Branly, in France, was among the first to improve on the delicate form of detector of these waves, which is called a coherer. Roughly speaking, if a vacuum tube is filled with iron filings the tube may be regarded as a nonconductor; but if a discharge of high frequency electric waves takes place in its neighborhood, the filings instantly cohere and the tube becomes a conductor. The slightest shake or tap brings the tube back to its normal condition. Among the students who experimented along these lines has been Mr. G. Marconi, who has made several improvements in the form of the coherer as well as in the form of the apparatus for transmitting the waves, and who has really been the first to adapt these signals to the purposes of systematic commercial telegraphy. The following brief description of the apparatus used by Mr. Marconi is taken from a paper read by him before the Institution of Electrical Engineers:

"When long distances are to be bridged over and it is not necessary that the signals should be sent in a definite direction, an arrangement such as shown in figure 1 is used. Two small spheres connected to the terminals of a secondary winding of an induction coil (c) are connected, one to earth and the other to a vertical conductor (w). The transmitter works as follows: When the key (b) is pressed the current of the battery is allowed to actuate the spark coil (c), which charges the spheres of the vertical wire (w), which discharges through the spark gap. This discharge is an oscillating one, and the system of spheres and insulated conductor becomes a radiator of electric waves. It will be readily understood that by pressing the key for long or short intervals it is possible to emit a long or short succession of waves, which, when they influence the receiver reproduce on it a long or short effect, according to their duration, in this way reproducing the Morse or other signals transmitted from the sending station.

"The coherer used is one designed by Mr. Marconi. It consists of a small glass tube (s), 4 centimeters long, into which two metal pole pieces (j j) are tightly fitted. They are separated from each other by a small gap, which is partly filled with a mixture of nickel and silver filings. This coherer forms part of a circuit containing the local cell and a sensitive telegraph relay actuating another circuit, which circuit works a trembler (p) or decoherer, and a recording instrument (h). In its normal condition the resistance of the filings in the tube (s) is infinite, or at least very great, but when the filings are influenced by electric waves or surges cohesion takes place instantly and the tube becomes a comparatively good conductor, its resistance falling to between 100 and 500 ohms. This allows the current from the local cell (g) to actuate the relay (n). One end of the tube is connected to earth and the other to a ver-

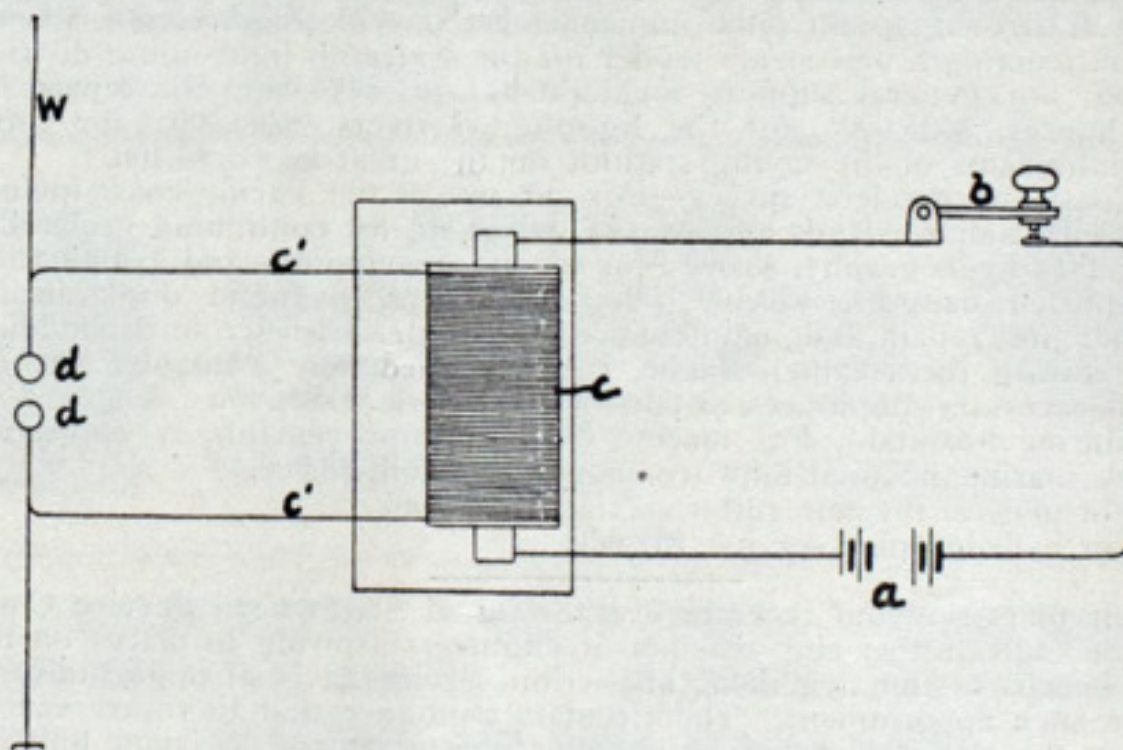


FIG. 1.

tical conductor similar to that of the transmitter, figure 1. All the electro-magnetic apparatus in the receiver is shunted by non-inductive resistances in such a manner that there may be no sparking at contacts and no sudden perturbations or jerks caused by the local battery current near the coherer. It was found that the relay tapper and telegraphic instrument if not properly shunted produced disturbing effects, the result of which was to prevent the coherer from regaining its sensitive condition after the receipt of electrical oscillations. No such trouble was experienced when suitable shunts were used, and Mr. Marconi attributes to their action in very great measure the success he has attained with this system.

"Small choking coils (k' k') are introduced between the coherer and the relay. They compel the oscillating current due to the electric waves to traverse the coherer rather than waste its energy in the alternative path afforded by the relay. The oscillations induced on the aerial conductor (w), which acts as resonator, by the radiation from the oscillator, affect the sensitive tube. This effect on the tube consists, as has been shown, in a great increase of its conductivity, thus completing the circuit and allowing the current from the cell to actuate the relay. The relay in its turn causes a larger battery (r) to pass a current through the tapper or interrupter (p), and also through the electro-magnets of the recording instrument (h).

"The tapper or trembler is so adjusted as to tap the tube and shake the filings in it. If in the instant during which these various actions take place the electrical oscillations ceased in the resonator, the shake or tap given to the tube by the hammer (o) would have restored it to its normal condition of high resistance and the Morse instrument or recorder would have marked a dot on the tape; but if the oscillations continue at very brief intervals the acquired conductivity of the tube (s) is destroyed only

for an instant by the tap of the trembler and immediately reestablished by the electrical surging, and therefore the relay tapper and telegraph instrument are again actuated, and so on until the oscillations from the radiator cease. The practical result is that the receiver is actuated for a time equal to that during which the key is pressed at the transmitting station. For each signal, however short, the armatures of the relay and tapper perform some very rapid vibrations dependent on each other. For it is the action of the relay which starts the tapper, but the latter by its action interrupts the relay. The armature of the Morse recording instrument, being rather heavy and possessing a comparatively large in-

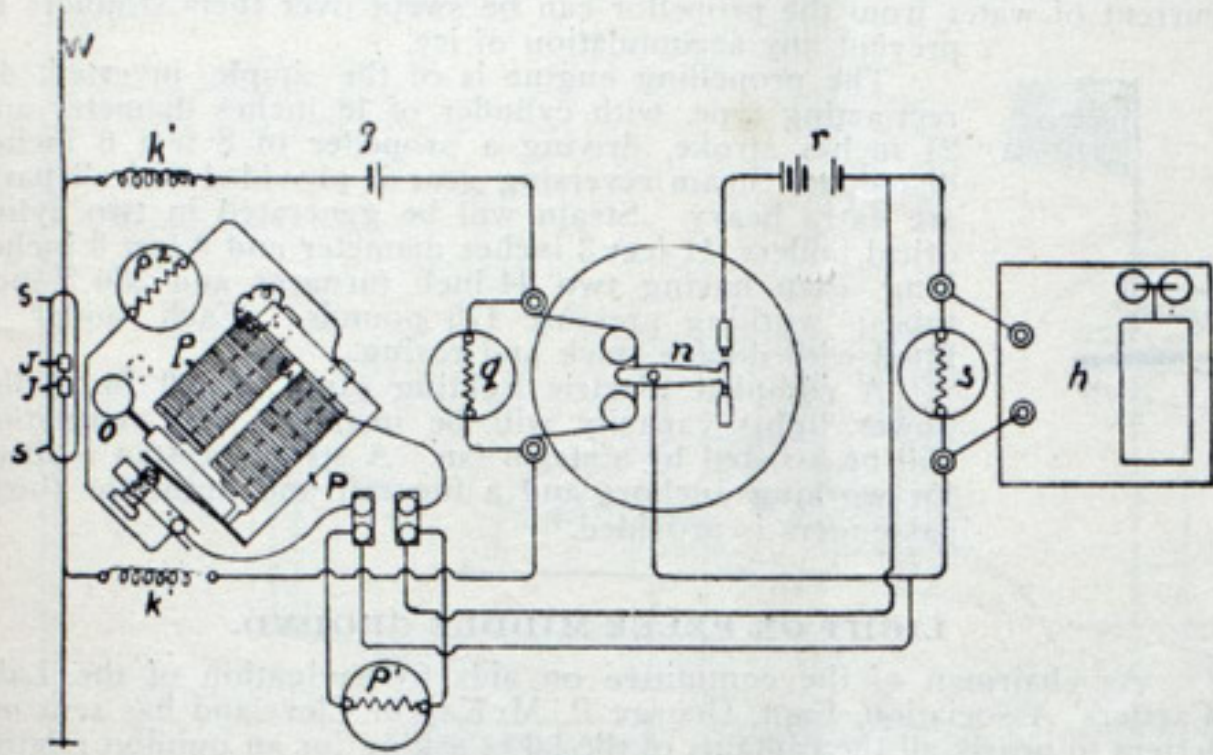


FIG. 2

ertia, cannot follow the very rapid vibrations of the tongue of the relay, but remains down all the time during which the rapidly intermittent action of the receiver lasts. In this way the armature of the inker gives a practically exact reproduction of the movements of the key at the transmitting end, dashes coming out as dashes and dots as dots."

The foregoing is a general description of the principal apparatus used by Mr. Marconi in his system of wireless telegraphy. It is impracticable to give the many improvements that have been made in the instruments themselves—and are still being made—or to enter into technical details. The principle remains the same, and while the system is far beyond the experimental stage, it is as yet in its infancy and new results are constantly developing and perfecting its application. Mr. Marconi has proved by experiment that up to certain limits, given a parity of conditions, the distance to which effective signaling extends varies approximately as the square of the height of the rod. A vertical wire 20 feet long at the transmitter and receiver is sufficient for communicating one mile, 40 feet at each end for four miles, 80 feet for 16 miles, and so on. Theoretically, there seems to be no limit to its range, given sparks powerful enough and conductors high enough. Practically, however, there are numerous obstacles.

Various applications of the Marconi system have occurred and have met with uniform success. It played an important part in recent British naval maneuvers and proved so satisfactory to the British Admiralty that a complete outfit has been supplied to the *Defiance*, the torpedo school ship at Davenport, for further experiments by naval officers. More recent still is the part played by this system in reporting the international yacht race between the *Columbia* and *Shamrock* and while the distances covered were much less than those already attained, it was the first practical demonstration of the possibilities and usefulness of wireless telegraphy in this country. The speed of signaling by this system appears to be from twelve to eighteen words a minute. It is stated, however, that a speed of twenty-two words has been attained, and this may doubtless be very materially increased.

Hitherto one of the chief objections to the use of wireless telegraphy has been the impossibility of concentrating the message, or in other words, to cut out a station and prevent a message from being received at other stations having installations within the radius of that for which the message was intended. Mr. Marconi claims to have an arrangement by which this can be overcome. In some experiments carried out on board the French dispatch boat *Ibis*, having on board a French commission, messages sent from the *Ibis* to the South Foreland were concentrated there, the East Goodwin light-ship being cut out. Similarly messages were sent to the light-ship, while the South Foreland was cut out. As a further test messages were sent simultaneously from Boulogne and the light-ship to the South Foreland, where the Boulogne message only was taken by the receiver, the other being cut out at will. This possibility is as yet, however, in its experimental stage, and at present it may be assumed that but one transmitter can be operated in the same neighborhood. The tests thus far made and the existing Marconi installations demonstrate the practicability of wireless telegraphy. It is stated that signals are now transmitted over 100 miles.

TRIALS IN OUR OWN NAVY.

At the conclusion of the yacht races Mr. Marconi conducted a series of experiments for the navy department under varying conditions with a view of testing its value for service use. For this purpose, sets of apparatus were installed on board the *Massachusetts* and *New York* and a third set on shore at the Highlands of Navesink. The first tests were at short distances while the two ships were at anchor in North river. These were followed by experiments over varying distances, the *Massachusetts* proceeding to sea, while the *New York* remained at anchorage in North river. Messages were received by the former all the way to Sandy Hook light-ship, but those sent by the *Massachusetts* failed to be received on the *New York* through fault of a poor earth connection on the latter. The *New York* then anchored 5 miles off Navesink, while the *Massachusetts* proceeded to sea for distance and interference tests. During the time the *Massachusetts* was under way messages were exchanged between her and the *New York* at intervals of ten minutes, interference messages being sent from Navesink at certain times with the result that when the *New York* and Navesink stations operated simul-

taneously, the *Massachusetts* received unintelligible signals. The *Massachusetts* and *New York* communicated up to 36 nautical miles. Advantage was taken of a gale to test this system under what would seemingly be the most unfavorable conditions. The *Massachusetts* anchored inside Sandy Hook and the *New York* in Gravesend bay. Both ships lowered the sprits to which the vertical wire was attached and hoisted the latter to their mastheads. In spite of wind, rain and fog, communication was perfect. The naval board appointed to conduct the above experiments reported as follows:

"We respectfully submit the following findings as the result of our investigation of the Marconi system of wireless telegraphy: It is well adapted for use in squadron signaling under conditions of rain, fog, darkness and motion of speed. Wind, rain, fog and other conditions of weather do not affect the transmission through space, but dampness may reduce the range, rapidity and accuracy by impairing the insulation of the aerial wire and the instruments. Darkness has no effect. We have no data as to the effects of rolling and pitching, but excessive vibration at high speed apparently produced no bad effect on the instruments, and we believe the working of the system would be very little affected by the motion of the ship. The accuracy is good within the working ranges. Cipher and important signals may be repeated back to the sending station, if necessary, to insure absolute accuracy. When ships are close together (less than 400 yards) adjustments, easily made, of the instruments are necessary. The greatest distance that messages were exchanged with the station at Navesink was 16.5 miles. This distance was exceeded considerably during the yacht races, when a more efficient set of instruments was installed there. The best location of instruments would be below, well protected, in easy communication with the commanding officer. The spark of the sending coil or of a considerable leak, due to faulty insulation of the sending wire, would be sufficient to ignite an inflammable mixture of gas or other easily lighted matter, but with the direct lead (through air space, if possible) and the high insulation necessary for good work no danger of fire need be apprehended. When two transmitters are sending at the same time all the receiving wires within range receive the impulses from transmitters, and the tapes, although unreadable, show unmistakably that such double sending is taking place. In every case, under a great number of varied conditions, the attempted interference was complete. Mr. Marconi, although he stated to the board before these attempts were made that he could prevent interference, never explained how nor made any attempt to demonstrate that it could be done. Between large ships (heights of masts 130 and 140 feet) and a torpedo boat (height of mast 45 feet), across open water, signals can be read up to seven miles on the ship. Communication might be interrupted altogether when tall buildings of iron framing intervene. The rapidity is not greater than twelve words per minute for skilled operators. The shock from the sending coil of wire may be quite severe and even dangerous to a person with a weak heart. No fatal accidents have been recorded. The liability to accident from lightning has not been ascertained. The sending apparatus and wire would injuriously affect the compass if placed near it. The exact distance is not known and should be determined by experiment. The system is adapted for use on all vessels of the navy, including torpedo boats and small vessels, as patrols, scouts and dispatch boats, but it is impracticable in a small boat. For landing parties the only feasible method of use would be to erect a pole on shore and then communicate with the ship. The system could be adapted to the telegraphic determination of differences of longitude in surveying. The board respectfully recommends that the system be given a trial in the navy."

In a letter to the naval board Mr. Marconi stated that he was unable to give a demonstration of the devices used for preventing interference, and of the means used for tuning or syntonizing the instruments, the reason given being that they were not completely patented and protected. It should also be stated that Mr. Marconi, before conducting these experiments, stated that the distance of transmission would not be so great as that obtained during the British naval maneuvers, as the apparatus brought was for the purpose of telegraphing the result of the yacht races, where long-distance transmission was unnecessary.

The advantages claimed for this system are its cheapness, and the ease and rapidity with which it can be transported and installed. In the occupation of colonial territory, for communication between vessels and the shore or other vessels, the system is invaluable. As the system now stands, the lack of secrecy, its susceptibility to interference, the fact that at best there can be only a limited number of stations within a given radius, and the slowness of transmission, all tend to limit its use to some such purpose as indicated.

AT THE HARLAN & HOLLINGSWORTH WORKS.

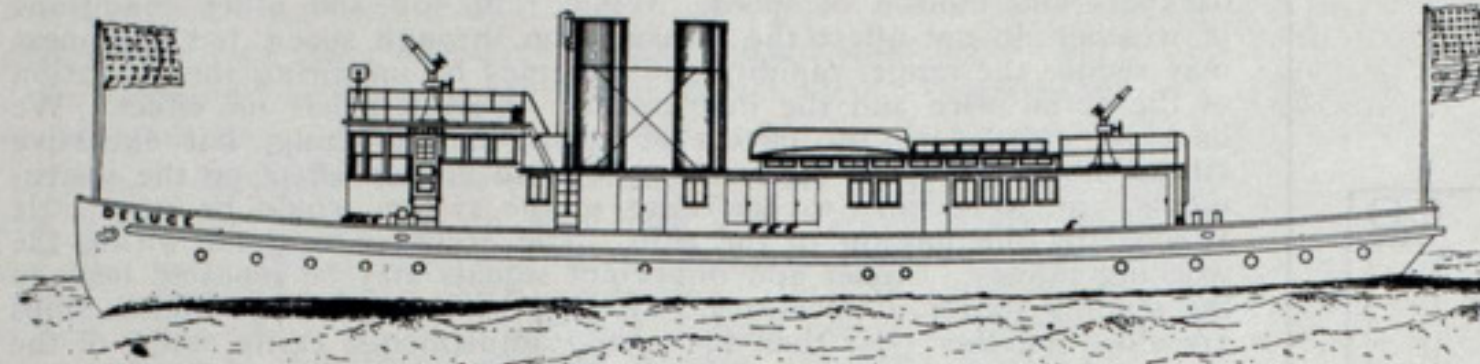
The Harlan & Hollingsworth Co., Wilmington, Del., on Saturday launched from one set of ways three tugs for the Pennsylvania Railroad Co. The boats were the *Wilmington*, *Johnstown* and *Harrisburg*. In the space of 17 minutes from the time the first wedge was driven the last boat struck the water. Dimensions of these tugs are: Length over all, 100 feet; beam, molded, 22 feet; depth, 12 feet 2 inches. A house on the deck of each of the vessels is partitioned off so as to form galley, boiler room, crew's water closet, engine room and cabin. Above this are pilot house, skylight, etc. Engines are of compound type with cylinders of 20 and 40 inches diameter and 26 inches stroke of piston. There are two Almy water tube boilers in each of the vessels.

Other work at this yard is progressing rapidly. The steamer *Whitney* for the Metropolitan Steamship Co. will be launched shortly. The *Mannahata*, launched last month for the New York & Baltimore Transportation Co., will be delivered this month, and the barges for the Rockland & Rockport Lime Co. are being rapidly erected. A new 400-foot steamer, the first of three for the Mallory line, will be laid down on the ways just vacated by the tugs for the Pennsylvania company. A yacht for Mr. Charles Fletcher of Providence, R. I., to be built at this yard, will be one of the handsomest additions to the fleet of 1901, and will be laid down immediately after the launching of the first of the barges for the Rockland & Rockport Lime Co. The steamer *Foxhall*, undergoing extensive repairs, will be delivered shortly. The steamer *Indian* of the Boston & Philadelphia Steamship Co.'s fleet, is being lengthened 40 feet. With all these new vessels and a very large amount of car work under way the plant of the Harlan & Hollingsworth Co. is about as busy as it has been at any time for a year past.

DETROIT FIRE BOAT.

DESCRIPTION OF A MODERN VESSEL OF THE FIRE-FIGHTING KIND NOW BUILDING AT THE WORKS OF THE DETROIT DRY DOCK CO.—PUMPS OF 6,000 GALLONS CAPACITY PER MINUTE.

Work is progressing favorably at the yards of the Detroit Dry Dock Co. on the new fire boat for the Detroit fire department. The hull of this boat is modeled for an efficient icebreaker and is strongly built of mild steel. The dimensions are as follows: Length over all, 122 feet; beam, 25 feet; depth, 13 feet. The hold is divided into four compart-



SHEER PLAN OF DETROIT FIRE BOAT.

ments by three watertight bulkheads. The fore hold is fitted for drying hose. The middle hold contains the boilers and coal bunkers and the after hold the propelling engines, fire pumps and workshop. The deck and pilot house is of steel, the room at the after end being fitted with reels for 2,000 feet of hose. Lockers are provided on each side amidships for nozzles and fittings.

The boat will be equipped with two sets of vertical triple fire pumps, which are now nearing a state of completion at the works of Thomas Manning, Jr., & Co. of Cleveland. These pumps are an innovation on the usual practice, inasmuch as they embody the triple feature in steam and water cylinders, these sets being the first of their kind ever built for fire-boat purposes. This arrangement was proposed by Mr. Beaufait, mechanical superintendent of the Detroit fire department. The requirements of modern fire boats are far more exacting than formerly, mainly on account of the extensive use of the underground pipe line system

pounds hydrostatic pressure. The combined capacity of the two sets of pumps is 6,000 gallons of water per minute. The steam cylinders are covered with magnesia, with steel jacket and polished heads to conform to the same general finish as the propelling machinery. The weight of the two sets of pumps will be approximately 32,000 pounds. The pumps were designed by Thomas Manning, and Mr. Frank E. Kirby, designer of the fire boat, says they are a splendid job.

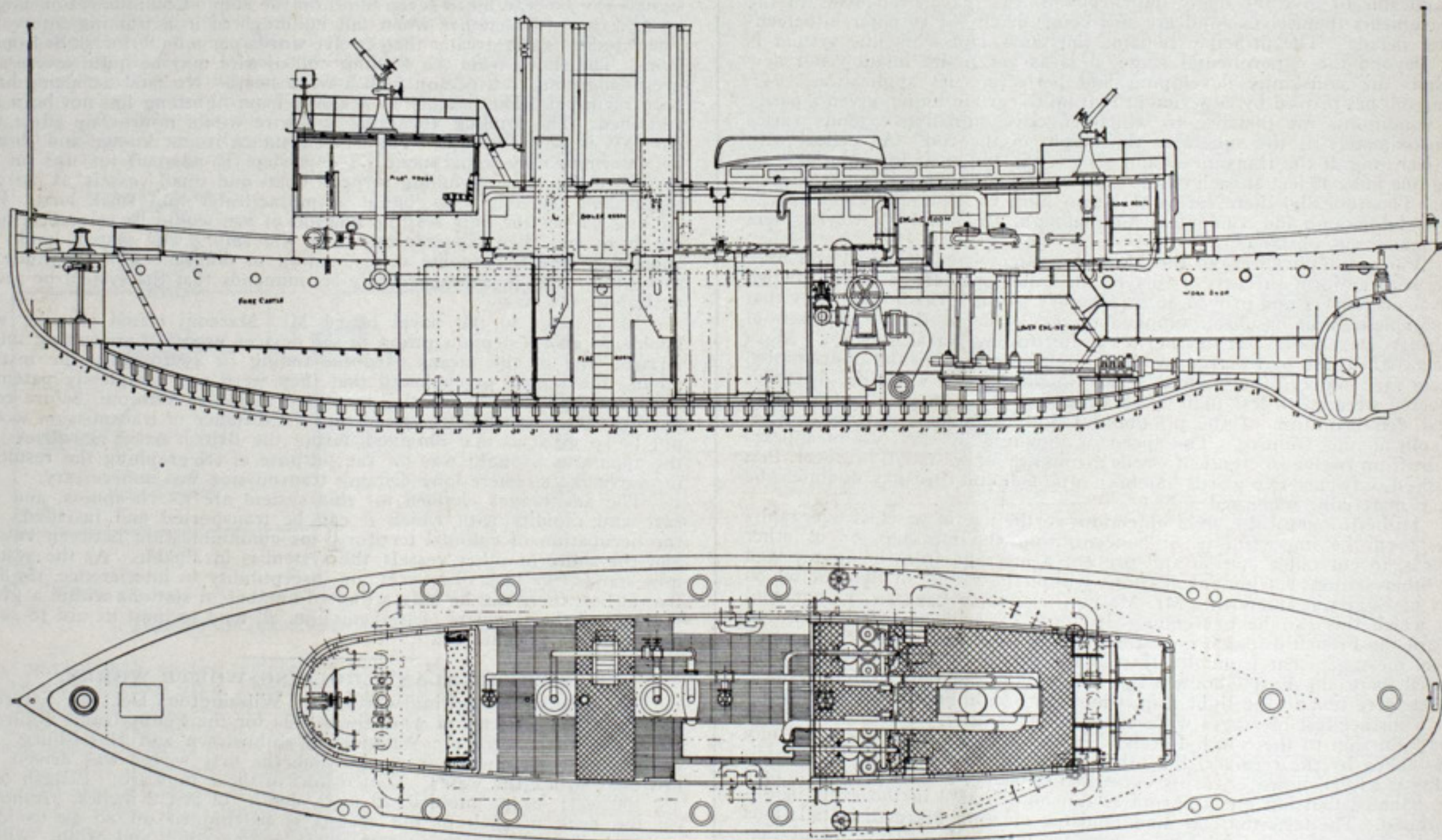
The boat is equipped with two water guns, one located on the top of the pilot house and the other at the aft end of the deck house. Twenty 3½-inch hose outlets are provided—ten forward, six amidships and four aft. Four suction sea valves, 12 inches diameter, are fitted so that a current of water from the propeller can be swept over their strainers to prevent any accumulation of ice.

The propelling engine is of the simple, inverted, direct-acting type, with cylinder of 18 inches diameter and 24 inches stroke, driving a propeller of 8 feet 6 inches diameter. Steam reversing gear is provided and all parts are extra heavy. Steam will be generated in two cylindrical boilers, 11 feet 3 inches diameter and 9 feet 6 inches long, each having two 44-inch furnaces and 336 2-inch tubes; working pressure 170 pounds. Each boiler is fitted with double stack and casing.

A complete electric lighting plant of 100 16-candle-power lights capacity will be installed, and ventilation will be assisted by a steam fan. A steam capstan is fitted for working anchors and a life raft and outfit for thirty passengers is provided.

LIGHT ON PEELE MIDDLE GROUND.

As chairman of the committee on aids to navigation of the Lake Carriers' Association, Capt. George P. McKay of Cleveland has sent out letters to nearly all the captains of the lakes asking for an opinion relative to the establishment of a light and fog signal station on the middle ground in Pelee passage, Lake Erie, instead of rebuilding the "dummy" light on Pelee point, recently destroyed by fire. This change was recommended by Col. Anderson, chief engineer of the Canadian department of marine and fisheries, and the Canadian officials very kindly consulted the Lake Carriers in the matter. About 90 per cent. of the replies to Capt. McKay are in favor of the change as proposed. Some of the vessel masters thought the new light would be of more service on South-east shoal. It is therefore hoped that the Canadian government may soon provide for



LONGITUDINAL SECTION AND PLAN OF NEW DETROIT FIRE BOAT.

through which immense quantities of water must be forced at very high pressure, and it is to attain this end and to make easy work of it, avoiding the jerky motion common to double pumps, that the triple has been designed. The plan permits of increased capacity with the same weight, greater strength, easier working and consequent durability.

There will be two sets of these pumps placed athwartships in the new boat. Each set has three steam cylinders of hard cast iron, 14-inch bore and fitted with piston valves; three water cylinders, 8-inch bore, of composition metal and cast in one piece, having a common stroke of 11 inches. The pumps are double acting, connected with suitable rods, cranks and fly wheels, and have about the same capacity as the largest double fire pumps now in service. The framing is the usual open style used in the Manning pumps at Baltimore, Detroit and Cleveland. The cranks are set at 120 degrees, thus bringing every part in perfect balance when working through long lines under heavy pressure. The pumps are tested to 450 pounds and the steam cylinders to 300

a permanent light of some kind, or a light-ship, on South-east shoal to replace the gas buoy now stationed at that point.

Capt. McKay also made inquiry of the vessel masters as to the need of again stationing at Ballard's reef, Detroit river, the light-ship that marked the upper end of the dredged channel at that point. Nearly all the replies favored the return of this light-vessel to its station.

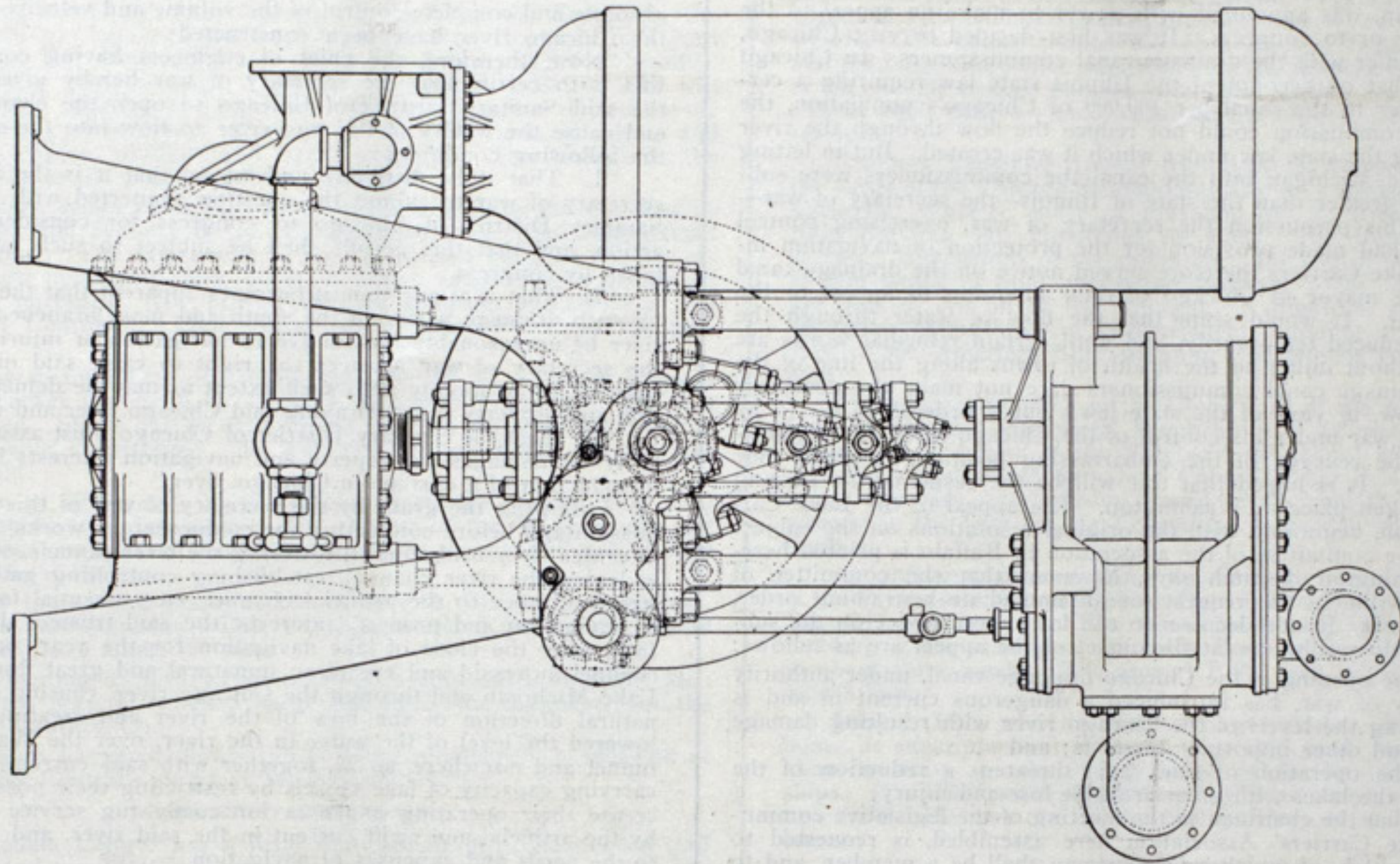
Referring to the proposed light on the middle ground, Pelee passage, Lake Erie, Capt. James Stone, United States supervising inspector of steam vessels at Cleveland, says in a letter to the Review:

"I notice an article in your issue of May 10 regarding the matter of establishing a light-house and fog signal station on the middle ground between Point Pelee and Point Pelee island, instead of rebuilding the light-house and crib recently destroyed by fire and known as the 'dummy' light. Having had thirty-seven years' experience on the great lakes, during which period I have had occasion to pass through this channel many times each year, and consequently being conversant with

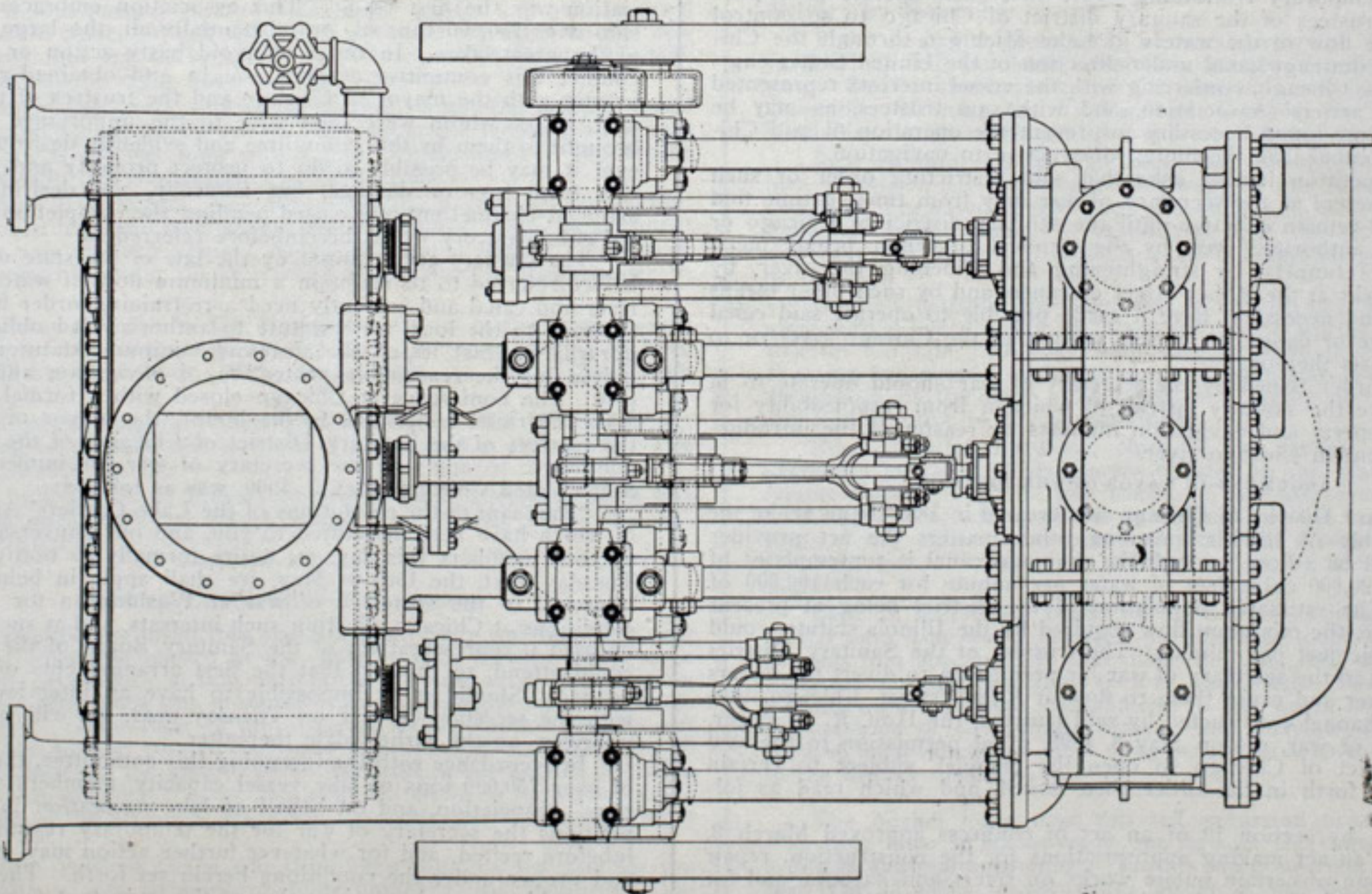
the danger of grounding at this point on account of the former position of the light, I know of no contemplated aid to navigation at this time that would contribute so much substantial benefit to almost the entire commerce of the great lakes as would the carrying out of Col. Anderson's suggestion in this matter. The peculiar position of the middle ground with relation to the adjacent shoal spots that have become serious and dangerous obstacles to safety since the advent of deep draught steamers, seems to offer particular advantages for a light-house as a guide in

approaching from either direction and passing through the Point Pelee passage with comparative safety. It is earnestly hoped that our neighbors will avail themselves of this opportunity of acting upon Col. Anderson's suggestion to the credit of Canada and the high appreciation of the entire merchant marine interests of the great lakes."

The United States coast survey steamer Endeavor will make a complete survey of the Delaware river.



TRIPLE STEAM FIRE PUMP.
14 & 8 BY 11.
SCALE 1/2" = 1'



TRIPLE PUMPS FOR NEW DETROIT FIRE BOAT—BUILT BY THOS. MANNING, JR., & CO., CLEVELAND.

THOS. MANNING, JR. & CO.,
CLEVELAND, O.
1896.

APPEAL TO THE SECRETARY OF WAR.

LAKE CARRIERS' ASSOCIATION ASKS FOR PROTECTION OF NAVIGATION INTERESTS IN CHICAGO RIVER—PROPOSED TEMPORARY REDUCTION IN FLOW OF WATER THROUGH CHICAGO DRAINAGE CANAL.

In Washington this week, leading officials of the Lake Carriers' Association are making an appeal to the secretary of war to protect navigation interests in the Chicago river against the dangerous current in that river and the lowering of the water level due to the operation of the Chicago drainage canal. The Lake Carriers are represented by President W. C. Farrington, ex-President Frank J. Firth, Counsel Harvey D. Goulder and Capt. M. M. Drake of Buffalo. When it was concluded, after the opening of navigation, that the vessel interests had little in the way of relief to expect in this matter from the Sanitary District of Chicago, a meeting of the legislative committee of the association was held in Buffalo. At that meeting a committee, of which Mr. Frank J. Firth is chairman, was appointed with power to make an appeal to the secretary of war or to congress. It was first decided to visit Chicago, however, and confer with the drainage canal commissioners. In Chicago it was learned that on account of the Illinois state law requiring a certain flow of water in the canal per 100,000 of Chicago's population, the drainage canal commission could not reduce the flow through the river without violating the state law under which it was created. But in letting water from Lake Michigan into the canal the commissioners were subject to a power greater than the state of Illinois—the secretary of war—and in giving this permission the secretary of war, exercising control over the river, had made provision for the protection of navigation interests. The Lake Carriers therefore served notice on the drainage canal officials and the mayor of Chicago of their intention to appeal to the secretary of war. It would seem that the flow of water through the canal may be reduced temporarily, and until certain remedial works are constructed, without injury to the health of towns along the line of the canal. The drainage canal commissioners dare not make the necessary reduction in flow, in view of the state law; but if ordered to do so by the secretary of war under his control of the Chicago river, the commissioners would be relieved of the embarrassing position in which they are now placed. It is hoped that this will be the result of the hearing that has just taken place in Washington. The appeal of the Lake Carriers' Association, beginning with the original resolutions on the subject by the legislative committee of the association in Buffalo is printed herewith. A Washington dispatch says, however, that the committee of vessel owners withheld the request for an immediate restraining order, in view of Secretary Root's decision to call for expert advice on the subject. The Buffalo resolutions at the outset of the appeal are as follows:

Whereas, the opening of the Chicago drainage canal, under authority of the secretary of war, has introduced a dangerous current in and is seriously lowering the levels of the Chicago river with resulting damage to navigation and other important interests; and

Whereas, the operation of said canal threatens a reduction of the general level of the lakes with great probable loss and injury;

Resolved, that the chairman of the meeting of the legislative committee of the Lake Carriers' Association here assembled, is requested to appoint a committee, of which said chairman shall be a member, and to which committee there is hereby referred, with power to act, the entire question of protection by appeal to the secretary of war or congress.

Resolved, that said committee is hereby advised to seek a conference with the committee of the Sanitary District of Chicago, before appeal.

PETITION TO THE SECRETARY OF WAR.

The committee respectfully petitions the secretary of war to immediately issue a temporary restraining order that shall operate to require the board of trustees of the sanitary district of Chicago to so control and restrict the flow of the waters of Lake Michigan through the Chicago river and drainage canal under direction of the United States engineer, resident in Chicago, conferring with the vessel interests represented in the Lake Carriers' Association, and with said trustees, as may be from time to time found necessary to prevent the operation of said Chicago drainage canal from becoming obstructive to navigation.

And this petition further asks that said restricting order or such modification thereof as the secretary of war may from time to time find desirable, shall remain effective until the sanitary district of Chicago or the municipal authorities will, by the removal of center bridge piers, by lowering of tunnels, by straightening and widening the river, by controlling works at the Robey street entrance, and by such other means as may be found necessary, have it made possible to operate said canal without damage or danger to vessels navigating the Chicago river or to property interests thereon.

No such order issued by the secretary of war should operate to in any way relieve the sanitary district of Chicago from responsibility for damage to property and navigation interests by reason of the introduction of a current in Chicago river.

ARGUMENT IN FAVOR OF THE PETITION.

The Sanitary District of Chicago was created in 1889 by an act of the general assembly of Illinois. Among other matters the act provides that there shall be a flow through the drainage canal it contemplates of not less than 20,000 cubic feet of water per minute for each 100,000 of population. The estimated population of the district being at present 1,800,000 people, the minimum flow required by the Illinois statute would be 360,000 cubic feet per minute. The trustees of the Sanitary District having applied to the secretary of war for permission to divert the waters of Chicago river and cause them to flow at Robey street, Chicago, into the artificial channel constructed by said trustees, the Hon. R. A. Alger, then secretary of war, did on May 8, 1899, grant permission to the said Sanitary District of Chicago to open the channel, subject to certain conditions set forth in the order then issued, and which read as follows:

"Whereas, by section 10 of an act of congress approved March 3, 1899, entitled 'an act making appropriations for the construction, repair and preservation of certain public works on rivers and harbors, and for other purposes,' it is provided that it shall not be lawful to alter or modify the course, location, condition or capacity of the channel of any navigable water of the United States unless the work has been

recommended by the chief of engineers and authorized by the secretary of war prior to beginning the same; and

"Whereas, the Sanitary District of Chicago, a municipal corporation, organized under the laws of the state of Illinois, has constructed an artificial channel from Robey street, Chicago, to Lockport, and has been heretofore granted permission by the secretary of war to make certain improvements in the Chicago river for the purpose of correcting and regulating the cross section of the river so as to secure a flowage capacity of 300,000 cubic feet per minute with a velocity of 1 1/4 miles an hour, it being intended to connect the said artificial channel with the west fork of the south branch of Chicago river at Robey street in the said city of Chicago; and

"Whereas, the said Sanitary District of Chicago has now applied to the secretary of war for permission to divert the waters of the said Chicago river and cause them to flow into the said artificial channel at Robey street, as aforesaid; and

"Whereas, the said Sanitary District of Chicago represents that such movable dams and sluice gates as are necessary to at all times secure absolute and complete control of the volume and velocity of flow through the Chicago river have been constructed;

"Now, therefore, the chief of engineers having consented thereto, this is to certify that the secretary of war hereby gives permission to the said Sanitary District of Chicago to open the channel constructed and cause the waters of Chicago river to flow into the same, subject to the following conditions:

"1. That it be distinctly understood that it is the intention of the secretary of war to submit the question connected with the work of the Sanitary District of Chicago to congress for consideration and final action, and that this permit shall be subject to such action as may be taken by congress.

"2. That if at any time it becomes apparent that the current created by such drainage works in the south and main branches of the Chicago river be unreasonably obstructive to navigation or injurious to property, the secretary of war reserves the right to close said discharge to said channel, or to modify it to such extent as may be demanded by navigation and property interests along said Chicago river and its south branch.

"3. That the Sanitary District of Chicago must assume all responsibility for damages to property and navigation interests by reason of the introduction of a current in Chicago river."

Following the grant by the secretary of war of this conditional permission and before completing the compensatory works, i. e. the removal of center river bridge piers, lowering the river tunnels, straightening and widening the river channel, establishing controlling gates at the Robey street entrance to the artificial channel, etc., essential for the protection of navigation and property interests, the said trustees did in December, 1899, after the close of lake navigation for the year, open the artificial channel aforesaid and create an unnatural and great flow of water from Lake Michigan and through the Chicago river, causing a reversal of the natural direction of the flow of the river and creating a current that lowered the level of the water in the river, over the Washington avenue tunnel and elsewhere, so as, together with said current, to decrease the carrying capacity of lake vessels by restricting their possible draught, increase their operating expenses for costly tug service made necessary by the artificial and swift current in the said river, and generally to add to the perils and expenses of navigation.

ACTION OF THE LAKE CARRIERS' ASSOCIATION.

Lake navigation opened at Chicago in 1900 about the middle of April. Immediately vessels experienced delays, damage and increased expenses in operating, caused by the changed conditions in the depth and current of the Chicago river. Appeals were at once made to the Lake Carriers' Association to inaugurate some action for the relief of navigation interests. The appointment of a committee from the Lake Carriers' Association was the first result. This association embraces in its membership over 750,000 tons of, or substantially all, the large carrying vessels of the great lakes. In order to avoid hasty action or any unnecessary conflict this committee at once sought and obtained an informal conference with the mayor of Chicago and the trustees of the Sanitary District, all of whom were fully alive to the importance of the questions brought to them by this committee and evidently desirous of doing whatever it may be possible to do to protect property and navigation interests from loss or damage, but naturally, not desiring to have their artificial channel entirely closed pending the completion of all the essential compensatory works hereinbefore referred to.

The trustees are required by the law of the state of Illinois hereinbefore referred to to maintain a minimum flow of water in the Chicago river and canal and evidently need a restraining order from some power superior to the local state statute to authorize and oblige them to temporarily at least lessen the aforesaid minimum statutory flow as is required for the reasonable protection of navigation and property interests. The conference at Chicago closed with a formal notice from the Lake Carriers' committee to his honor, the mayor of Chicago, and to the trustees of the Sanitary District of Chicago, of the intention of this committee to apply to the secretary of war for immediate relief. The notice dated Chicago, May 9, 1900, was as follows:

"Pursuant to the resolutions of the Lake Carriers' Association, copies of which have been submitted to you, and our conversation with certain of your members this day, we desire formally to notify you that about Tuesday next, the 15th of May, we shall apply in behalf of navigation interests, to the secretary of war at Washington for some remedy of conditions at Chicago affecting such interests, and at such time we should be glad if representatives of the Sanitary Board of the City of Chicago could attend, to the end that the best arrangements of the matter may be had. Should it be impossible to have an interview on the subject with the secretary of war on Tuesday next, we will press for such an interview on the earliest date thereafter."

In accordance with the foregoing this committee, therefore, on behalf of over 750,000 tons of lake vessel capacity, members of the Lake Carriers' Association, and on behalf of lake navigation interests generally, petitions the secretary of war for the temporary restraining order hereinbefore recited, and for whatever further action may to him seem right and proper under the conditions herein set forth. The committee does not at this time ask consideration of the important question of the effect of the continued operation of this canal upon the general level of the great lakes.

NEWS FROM BOTH COASTS.

BRIEF ITEMS FROM SHIP YARDS OF BOTH THE ATLANTIC AND PACIFIC—A FEW NEW ORDERS ARE STILL NOTED.

What will probably be the most complete steam engineering building owned by the government is now in process of erection at the Brooklyn navy yard. It will be large enough to permit the building of the engines for at least three new vessels without interfering with the regular repair work. The building is to be in four parts with a machine shop fronting on Morris avenue, and three wings built at right angles to the former, which will be used as an erecting shop, a boiler shop and a power house. The machine shop will be 350 feet long by 130 feet wide. The erecting shop will be 500 by 130, the boiler shop 300 by 96 and the power house 100 by 85. The machine shop will have three cranes. The work on the new building is being done under the personal supervision of Civil Engineer Asserson.

New four-masted schooner Georgia for the Coastwise Steamship Co. of New York was launched last week from the New England Co.'s yard at Bath, Me. Her dimensions are: 235.5 feet length; 43.3 feet breadth; 20.5 feet depth; gross tonnage, 1,609.56; net tonnage, 1,488.86. She will have a carrying capacity of 3,000 tons. She was built for the coal trade and is staunchly constructed. She will spread 3,000 yards of canvas and has a Hyde engine, windlass and wrecking pump. The Georgia is the fifteenth barge in the Coastwise company's fleet.

Twin-screw steam yacht Hirondele has been sold by the Gas Engine & Power Co. and Seabury & Co., Consolidated, to J. Fred Zimmerman of Philadelphia. The Hirondele is now at Morris Heights, N. Y., receiving a new mahogany deck house, a dining saloon and a bridge aft for steering purposes. The Morris Heights company has also sold the steam yacht Charlietta. Fred Fraser of Syracuse, N. Y., is the purchaser.

The new steamer City of Clifton, built for the St. Louis & Tennessee River Packet Co. by E. J. Howard of Jeffersonville, Ind., has just been launched. She is one of the prettiest craft on the Mississippi and is of the following dimensions: 190 feet long, 38 feet beam and 5½ feet depth of hold.

A report in Richmond, Va., is to the effect that another ship yard may be established at that point. The success of the Trigg works and Newport News yard has attracted capitalists to the possibilities of ship building in the south.

Keel for the second vessel at the McKay & Dix yard, Bucksport, Me., was laid last Saturday. This vessel is intended for the Greenland trade and will be of about 700 tons.

Next launching at Kelley, Spear & Co.'s ship yard, at Bath, Me., will take place May 20, when a barge will enter the Kennebec for the Commercial Towboat Co.

West Shore ferryboat Newburgh is being extensively overhauled at the New York Central's shops at Weehawken, N. J.

ALONG THE PACIFIC COAST.

The Tacoma Ledger has a little item which must have been gall and wormwood for Seattle. It relates to the fact that eight of the big mortars intended for the government fortifications had to be shipped from Seattle to Tacoma because there were not marine shears big enough at Seattle to handle them. John B. Hardy of Tacoma, who lately purchased the plant of the Western Machine & Engine Co., swung them from the cars to the ships.

Keel of a large sailing vessel is about to be laid at the ship building yards of W. A. Boole & Son, Oakland Creek, San Francisco. The vessel is to be a four-masted bark of 1,100 tons register and will be used in the Honolulu trade. Work will begin within thirty days on the new marine railway and dry dock, which the Booles will build at Oakland. About \$80,000 will be spent upon the improvement.

The steamer California, one of the largest, if not the largest, vessel ever built on the Pacific coast, will be launched at the Union Iron Works this week. She is 488 feet long with a total displacement of 16,200 tons and a dead weight carrying capacity of 10,600 tons.

The Vulcan Iron Works, San Francisco, has a contract for supplying the required iron and steel shapes for the United States government works under way at Pargo-Pargo, island of Tutuila, Samoa. The work in San Francisco is under the immediate supervision of Commander F. J. Drake.

It is reported that the Willey Navigation Co. is in the market for a new steamer for the Olympia-Seattle route. The new boat is to have a speed of 18 knots an hour. Plans of the boat are said to have been made.

It is understood that the Fairhaven Land Co. of Fair Haven, Wash., is endeavoring to promote the location of a shipyard at that point. The chances of success are fair.

Launch built for C. F. Meyers of Seattle by Crawford & Reid was launched last week from the Puget Sound Iron Works, where the machinery was installed.

AMONG LAKE SHIP BUILDERS.

Buffalo newspapers insist that the American Ship Building Co., now in control of what was known as the Mills yard at Buffalo, propose to have one very large dock at that yard, although officers of the company said when the Mills yard was purchased that no changes would be made for the present. Dimensions of the proposed enlarged dock are 600 feet length, 102 feet wide at top, 62 feet wide at bottom, 20 feet deep and 15 feet on water blocks; the gate to be 66 feet wide at top and 62 feet wide at bottom. It is said that if space available will admit of the construction and operation of the proposed dry dock, the work will be commenced at once.

Mr. Robert Wallace of the American Ship Building Co. and his son James C. Wallace, general manager of the company, will be leaving next week for an extended European trip. It is the intention to devote a large part of their time in England and Scotland to visiting the principal ship

yards. As the Messrs. Wallace will be out of the country for about three months, it is not probable that any important changes or new undertakings at the different works of the consolidation will occur in their absence. The contract for a large fleet of Canadian canal-size steamers similar to those already begun for A. B. Wolvin and others is still talked of, and there is considerable figuring going on regarding other new vessels, but the lower prices expected in material will probably delay for some time a conclusion of negotiations for any of these vessels. An effort is being made in Cleveland to form another syndicate for the construction of eight or ten steamers of canal size.

Mr. W. D. Kearfott of the Geo. F. Blake Mfg. Co., who is well known to everybody using pumps on the lakes, dropped into Cleveland a few days ago and secured the order for pumps for two canal-size steamers that are to be built by the American Ship Building Co. for Mr. A. B. Wolvin and others, and which are only now being put down. The pumping equipment throughout both steamers will be of Blake manufacture and of the most improved type, equal to the equipment of any vessels as yet built either in this country or abroad. The air pumps will be in accordance with the latest marine practice, namely, vertical simplex feather-weight. The ballast pumps will be horizontal cross-compound simplex, and the bilge and cooler pumps also of the simplex type, with feed pumps of the outside packed plunger compound duplex type. All of the pumps will be built with a view of passing the highest classification for ocean service.

The new Bessemer steamer Robert W. E. Bunsen was launched from the yards of the Chicago Shipbuilding Co. on Tuesday of this week. Miss Catherine Wheeler, niece of President W. L. Brown of the American Ship Building Co., christened the boat. The Bunsen is a typical ore carrier. Dimensions of the vessel are: 461 feet in length; 50 feet beam; 29 feet depth of hold; registered tonnage 5,029. She will carry 7,500 net tons of ore on 18 feet draught. A duplicate steamer, also for the Bessemer Steamship Co. (Rockefeller), building at the West Superior yard of the American Ship Building Co., will be launched in about ten days.

The steamer building at the Globe yard of the American Ship Building Co. for the Pittsburgh Steamship Co. (Carnegie) will be named Rensselaer in honor of the Polytechnical school at Troy. It was said that this vessel would be named Columbia, but it is fortunate that such is not the case, as confusion would result from the fact that there are already in the lake list six Columbias, large and small, and also a Columbian.

According to present plans, the Carnegie steamer Harvard, building at the Wyandotte ship yard of the Detroit Dry Dock Co., will be launched Saturday of this week. The steamer Simon J. Murphy, 442 feet long, building at the same yard for Eddy Bros. of Bay City, will be launched in about three weeks. The second Eddy boat will be launched about a month later.

John J. Hill, who has built a large number of very good wooden boats, as superintendent of the Morley ship yard, Marine City, Mich., is about to leave for the Pacific coast, where he will continue building ships. Mr. Hill's work at Marine City is an assurance of success in the new field. He was one of the best builders of wooden vessels on the lakes.

NAVAL MATTERS.

The battleship Kearsarge has sailed for the Virginia capes, where she will spend some time in swinging compasses and gun practice.

Rear Admiral M. T. Endicott, chief of the bureau of yards and docks, went to New Orleans last week to select the site for the floating dock which is now under construction at the yards of the Maryland Steel Co., Sparrow's Point, Md. It is expected that the dock will be ready for delivery by November.

There is now a great array of warships at the League Island navy yard, which will no doubt attract thousands of persons in the summer time. Besides the Indiana and the Massachusetts there are the cruisers Columbia, Minneapolis, Yankee and Panther, the Miantonomah and Kathadin, the Arethusa and the colliers Pompey and Leonidas.

Rear Admiral Philip Hichborn, chief constructor of the navy, and Mrs. Hichborn left Washington this week for the Pacific coast. They will visit San Francisco, Seattle and Portland and will return east by the Canadian Pacific route. It is possible that the chief constructor will also visit San Diego. If he does a public reception will be tendered him by the city.

Dewey's flagship, the Olympia, is now in dry dock at the Boston navy yard. The docking of this vessel was a feat of which Naval Constructor William J. Baxter, who superintended it, may well be proud. The ship had about 6 inches to spare on each side as she passed through the mouth of the dock. The hull, not having been docked for over eighteen months, is in foul condition.

Rear Admiral Bradford, chief of the bureau of equipment, has effected a purchase of sixty acres of land on the Maine coast of Mount Desert channel, opposite that island. There are seven fathoms of water in the approach, which affords ample facilities for caring for the largest ships of war. Plans have been completed for a large naval coaling station equipped with automatic machinery and the latest devices for handling fuel.

Capt. S. C. Lemley began his third term as judge advocate general of the navy last week, having been promptly confirmed by the senate. He was first appointed to that office in June, 1892, and has served continuously through two terms of four years each. His reappointment for a third term is a high compliment to his worth and efficiency in the performance of exceedingly difficult and intricate duties, including all sorts of legal functions. Such long service in a bureau office is very rare in the history of the navy.

The Nickel Plate road will sell excursion tickets to Philadelphia, Pa., June 14 to 18 inclusive, at one fare for the round trip, account Republican national convention. Tickets are good returning to and including June 26, 1900. Write, wire, phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind.

82 June 14

MR. W. I. BABCOCK QUILTS THE LAKES.

Mr. W. I. Babcock, president and general manager of the Chicago Ship Building Co., has resigned, to take effect July 1, and on that date he will quit the lakes definitely. He has said nothing of plans for the future. A man of his ability and business connections would certainly have several places open to him.



W. I. BABCOCK.

He is probably not in a hurry to settle anywhere. In all the large industrial consolidations that have taken place of late, big men in the different companies entering into these consolidations have disagreed. Nothing is said on this score in Mr. Babcock's case, but the cause of his resignation could undoubtedly be traced back to disagreements beginning with the organization of the American Ship Building Co.

For ten or twelve years past Mr. Babcock has certainly been in the front rank of ship builders, not on the lakes alone, but throughout the United States. He had a thorough training in naval architecture and marine engineering before undertaking the management of the Chicago works. These works, although organized only a few years, were turning out new vessel property to the value of about \$1,000,000 a year

when the consolidation took place. The Chicago plant is one of the best owned by the consolidation. To Mr. Babcock more than any other builder in this country is due the credit for having developed pneumatic tools for ship construction. He was riveting up the hulls of ships complete with pneumatic tools in Chicago before they were used at all in other parts of the country. The part he took in developing the channel system of construction is equally creditable. In all the meetings of the Society of Naval Architects and Marine Engineers, and other organizations of a similar kind, papers on engineering subjects have been eagerly sought from him. He is one of the progressive young ship builders of America.

REMARKABLE PERFORMANCE OF CARNEGIE RAILROAD.

According to Vice-President J. T. Odell of the Pittsburg, Bessemer & Lake Erie Railroad the freight of the Carnegie Steel Co. in raw material and finished product last year amounted to 16,000,000 tons. He says that this tremendous tonnage is as great as the combined tonnage of the Northern Pacific, Union Pacific and Missouri Pacific railways, embracing as they do more than 13,000 miles of track and running probably 1,500 locomotives and 50,000 freight cars. In the operation of the Pittsburg, Bessemer & Lake Erie railroad by and in the interests of the Carnegie Steel Co., (Conneaut on Lake Erie to Pittsburgh) the following results have been obtained:

"The lowest rate per ton per mile, the highest average length of revenue haul in proportion to its freight train mileage, the greatest average paying load, and the lowest 'ton mile cost' of any road on the American continent reporting to the interstate commerce commission. The average paying load of all its freight trains, including three branches, and with but little back-loading, was, for the year ending on Dec. 31, 1899, 777 tons. It is confidently expected when the south and northbound tonnage is 70 per cent and 30 per cent respectively, and the tonnage reaches 5,000,000 tons annually, as it promises, that the average paying load will be not less than 900 tons, or $4\frac{1}{2}$ times greater than the present average paying load of the country. The maximum weight of the paying load for the year was 1,580 net tons, with the average as before stated of 777 tons. Of the ore trains, each earned on a $3\frac{1}{2}$ -mill rate per ton per mile (gross tons), \$.13 per train mile. The permanent maximum grade in the direction of the ore traffic will be 31 feet to the mile. There are five of these grades, aggregating a distance equal to 30 per cent of the total distance. These grades are worked by an assistant engine. The ore equipment consists mostly of steel cars, weighing 17 tons, and carrying 50 tons of ore. The company is having built a few of what will prove to be the heaviest locomotives in the world, having cylinders 23 by 32 inches, and weighing 217,000 pounds on the drivers. With these locomotives the total weight of an ore train, including the locomotive and light weight of the cars, will be about 2,600 tons."—Iron Trade Review.

Ashtabula has been credited in the past with a progressive spirit in everything pertaining to its lake commerce, and it would seem therefore that the county and town officials should give up politics long enough to make navigation safe in that part of the river which is crossed by the bridge maintained by the county authorities. The bridge is badly located to begin with, but of late the danger to vessels passing through it has been increased by the construction of a high brick building on the west side of the river close to the bridge and built up to the very bank of the stream. It is evident to all vessel men who have visited Ashtabula of late that a crib protection of some kind must be built out from the bridge abutment in front of this building, or a very bad accident will some day occur at this point. The delays to navigation that would result from an accident to this bridge, or from a vessel striking in front of the building referred to, would amount to a hundred times more in loss to shipping than both bridge and building are worth. The vessel interests are not supposed to know who should pay for this necessary protection, but they have a right to ask that the people of Ashtabula take steps at once to remove the danger of accident that now exists at the bridge.

The Pittsburg Chain Co. has been incorporated at Pittsburg, Pa., with capital of \$25,000. The directors are R. A. Ebe, J. W. Anderson and others. The company will begin business about June 1. The plant is outside the chain combine.

AROUND THE GREAT LAKES.

Canal officials of Canada have ordered that the Welland canal be closed Sundays between the hours of 6 a. m. and 9 p. m.

Mr. H. W. Thorpe and other officials of the Goodrich Transportation Co., Chicago, are especially pleased with the big excursion steamer Columbus. They are undoubtedly warranted in thinking, since she was changed last winter, that she is about the only boat in the Lake Michigan part of the world.

Senator Hanna and Congressman Burton of Ohio are both endeavoring to secure at the present session of congress authority for a survey for certain improvements that are required in the entrance between the two arms of the breakwater at Cleveland harbor, and also for the extension of the east arm of the breakwater.

Capt. J. M. Twitchell died at his home in Chicago a few days ago, aged forty-eight years. Capt. Twitchell had been in the employ of the Lake Michigan & Lake Superior Transportation Co. for a number of years, during which he was master of several steamers in the line, his last command being the steamer City of Traverse.

The St. Mary's Falls canal will be in the charge of the following men this season: Superintendent, Donald M. MacKenzie; chief engineman, E. Green; assistant superintendent, R. J. McKeone; Poe lockmasters, J. Campbell, Sr., John McNaghton and Lawrence Ermatinger; Weitzel lock, Charles H. Spaulding, R. D. Ashmun, James Galley.

It is quite probable that an appropriation will be secured at the present session of congress for a revenue cutter to take the place of the Morrell on the St. Mary's river and to cost about \$75,000. Senator McMillan has succeeded in placing an item of this kind in the sundry civil appropriation bill in the senate and will probably hold the appropriation when the bill goes to a conference committee from both houses.

Mr. L. C. Hanna, who has for several years been the working head of the firm of M. A. Hanna & Co. of Cleveland, ship owners and extensive dealers in iron ore, pig iron and coal, is on his way to Europe in search of health. His place is taken by the youngest member of the firm, D. R. Hanna, who is fortunate in being surrounded by a very strong force of men in different departments who are in some cases younger than himself.

Vessel owners in all parts of the lakes are now talking by long distance telephone with Duluth, Marquette, Escanaba, Iron Mountain and other points in the Lake Superior region. This section of the country has had lines extending over a few hundred miles of territory, but has only recently been connected with the rest of the world, so to speak. The vessel interests are among the largest patrons of the long-distance telephone service.

Referring to the unpleasant position in which the Chicago drainage canal commissioners have been placed by the fact that the secretary of war may shut off the flow of water for the canal to protect navigation interests of the Chicago river, Major T. W. Symons, United States engineer at Buffalo, says: "The experience of the canal commission illustrates the folly of going on with a great big undertaking without having the whole thing completely mapped out and thoroughly understood. The Chicago people ought, with care, to have been able precisely to determine what the effect of this canal would be, and they ought to have a thorough understanding with the government in the matter, which is something they never have had. So far as the rights of navigators go I imagine if the government chooses to take action in the matter its dictum would have to be obeyed. Major Marshall, the federal engineer stationed at Chicago for many years, warned the people of that city that if a current were created in Chicago river it would be almost impossible to use the river for navigation."

SUSPENSION OF LICENSE.

The North Star-Siemens collision in the St. Mary's river in November last, which blocked navigation and caused great loss to Lake Superior shipping interests, was the subject of a great deal of discussion among vessel men, and it was agreed that when fault was determined the government officials should deal sternly in the matter. Later on when an investigation of the collision was being held at Sault Ste. Marie by Charles M. York and Charles M. Gooding, local inspectors of the district, who are located at Marquette, it was said in newspaper dispatches that the investigation was demanded by Capt. Gunderson of the Rockefeller steamer Siemens, but that the testimony was decidedly against his version of the collision. Now comes a report of the decision of the local inspectors. It is only fair to say first, in justice to Capt. Gunderson, that he did not call for the investigation. The trial was in accordance with the law in the matter, which requires the inspectors to investigate all collisions occurring within their respective districts. The decision of the inspectors was against Capt. Stewart of the North Star. His license was suspended for a period of sixty days, namely, from March 26 to May 24, 1900, inclusive, "for willful violation of rule 6 of the pilot rules for the great lakes." This decision will not, of course, influence in any way the decision of the United States courts in this matter. Neither is it referred to here with a view to its bearing upon the legal action, but out of justice to the captain of the Siemens on account of the reports sent out from the Sault.

At the next meeting of the board of regents of the University of Michigan (Ann Arbor) arrangements will be completed for a course of marine engineering and naval architecture. Although the course has been authorized for a year, Prof. Cooley has been until now unable to find a suitable man to take charge of the work. He made the announcement to his class a few days ago, however, that he had found two available men, one of whom will be chosen. One is a prominent naval architect, well known on the eastern seaboard, and the other is at present an assistant professor of naval architecture at the University of Glasgow, Scotland. The course which will be offered at Michigan will comprise a year and a half of work. Prof. Cooley said that there is a great future for the university in marine work. He is of the opinion that the United States is soon to become the greatest ship building nation from purely natural causes. The great lakes will be an important factor in the development, he said, and Lake Erie will be the greatest producing section.

SENATOR FRYE ON THE SHIPPING BILL.

HE DENIES THAT IT HAS BEEN ABANDONED—THE REPORT OF THE DEMOCRATIC MINORITY IS FILED—AN ARGUMENT IN FAVOR OF FREE SHIPS IS WHAT IT AMOUNTS TO.

It was brought to the attention of Senator Frye a few days ago that certain eastern papers were claiming that the shipping bill had been abandoned at this session.

"As chairman of the committee which reported the bill," said Mr. Frye, "I think if it were to be abandoned at this session I would know something about it. But I have no such information and neither has anybody else. I expect to see the bill passed in the senate at this session. There is a strong and increasing demand for it. The measure is of vital importance to the interests of the nation. Our consuls are reporting from various parts of the world the need of American steamship lines. Republican conventions are reiterating their demands for the passage of the bill and the party will redeem its promises in that respect."

The minority report opposing the bill has been filed in the house of representatives by the majority of the members of the democratic minority of the committee on merchant marine and fisheries. Representative Fitzgerald of Massachusetts drew the report which was signed also by Representatives De Vries of California; Daly of New Jersey and Speight of Mississippi. Three other democrats of the committee—Messrs. Chandler, Small and Ransdell—have heretofore submitted their views, upholding the general principle of government aid to the merchant marine, but pointing out defects in the bill. The present report therefore represents the opposition to the measure both in principle and in detail. In the main it is an argument against government subsidies, and asserts that most of the proposed \$9,000,000 subsidy will go to a few favored concerns, without building up American shipping in general or encouraging American exports. The report quotes a recent utterance of President McKinley on the remarkable increase of our ship building, and says in part:

CLAIMS OF OPPONENTS OF THE MEASURE.

"Our foreign trade, then, is increasing with wonderful rapidity and our ship building industry is remarkably prosperous without subsidy. Why, then, should the whole country be taxed to provide gratuities to industries which are now prosperous and which have every prospect of continuing to be more and more prosperous? Even if our foreign commerce were in a declining rather than in a fairly prosperous condition, it is improbable that the present bill would give any relief and for the following reasons:

"Because subsidies are graded according to the speed and capacity of ships, and are more than twice as high per ton of capacity for the swift passenger steamers, which carry but little cargo, as for ordinary freight steamers, which carry 80 or 90 per cent. of our exports. The subsidy, therefore, if it affects rates at all, will affect passenger rather than freight rates. As only about 5 per cent. of the total tonnage of the world's shipping is subsidized and as nearly all of the present subsidy goes to passenger and mail steamers, the hopelessness of trying by subsidy to lower freight rates and increase commerce is apparent. Unlimited subsidy would be necessary to lower general freight rates. If any one country attempts by subsidy to secure lower rates the subsidy must go to all ships carrying freights. Otherwise the moment the few subsidized ships lower rates for one country the unsubsidized ships (tramp steamers, etc.), will withdraw to other service and rates for this particular country will go back to the world's level. Hence it is practically beyond the ability of any one country to materially reduce by subsidy its ocean freight rates and in this way to increase its foreign trade.

"The bill does not sufficiently provide for subsidies based upon the amount of freight carried, nor does it require any decrease in freight rates. It cannot be shown from the history of subsidies that they ever materially lowered freight rates or increased the commerce of the countries granting them. Trade conditions and not trade theories fix the rates which shippers will pay, and which ship owners can get. Neither does the history of subsidies show that any country has ever built up its merchant marine in this way. Our experience with the Collins, Brazil and Pacific mail lines is the present experiences of France and Italy and the past experience of all other countries which have given real subsidies. As the government could not under the proposed law, take American ships for cruisers or transports on any more favorable terms than it can now obtain them, viz., by paying for them all they are worth, it will on this score get nothing in return for its lavish subsidy expenditures. Neither is there anything in the bill which would provide American seamen for our national defense. In no way, then, would this bill provide for the national defense. On the contrary, by draining \$9,000,000 a year from our treasury it weakens our national defense by taking money which might otherwise be invested in more ships or in transports, provisions, ammunition, etc., in case of war.

"Such a large amount of subsidy practically put at the disposal of the few who benefit by this bill cannot but tend to unite, even more closely than now, the great ship building, ship owning and railroad interests concerned in this measure. By the time these few interests bring in their foreign-owned ships and get their ships now being built into the subsidy race the \$9,000,000 limit will undoubtedly be reached. Hence it will be to their interest to combine to stop competition and to prevent their subsidy rates and profits from declining. We believe that such a combination would be completed soon after the passage of this bill. We place no faith in the anti-trust amendment. All the federal and state anti-trust laws now in existence have proven futile and have not lessened the rapid growth of trusts. We see no reason for thinking that this anti-trust amendment would prove more effective. By this bill, which professes to be intended to increase the exportation of American produce, the government is asked to pay to the stockholders of a single steamship line \$1,500,000 a year for carrying abroad in its four first-class passenger ships, not American products, but American tourists, who can afford to travel and spend their money in Europe. That is, the government is asked to pay, not for the exportation of American produce, but for the exportation of American customers."

The report contends that even if subsidies are justifiable in building

up an enterprise, such as the Pacific roads, yet there is no justification for "a reward to existing lines."

GENERAL SUMMARY OF OBJECTIONS.

As showing the proportions of the proposed subsidy, it is stated that \$9,000,000 a year "constitutes interest upon \$450,000,000 at the rate now yielded by our government bonds" and it is urged that the government could better afford to use this aggregate "to build ships and give them away than to make the donations provided in this bill. It is stated that \$250,000 would go to ships over twenty years old and therefore encourage the running of these old ships, for the sake of subsidy until they go to the bottom with crew and cargo.

The report, while it does not advocate the free ship theory, points out that in its investigations it found that every nation except the United States allowed its citizens to purchase ships where they please. In answer to the proposition that other nations are increasing their shipping by subsidies the report claims that Great Britain, which has the largest shipping, subsidizes less than 3 per cent. of her tonnage, and this is on mail subsidies except \$1,073,000. The report contains what is stated to be the actual figures of operating the St. Paul of the Anchor line, and Campania of the Cunard line, showing an increased cost of running of the former of \$15,900 per year, and thus, the report states, would be met by a subsidy of about \$400,000. The report quotes from the manifests of a number of freight and passenger ships showing that the freighters which carry the product of the farm and warehouse receive about one-fifth that of the passenger craft. In conclusion the objections are summed up as follows:

1. The objects professed in the title are entirely forgotten in the body of the bill.
2. It is reasonably certain that the most of the subsidy would go to lines already established and prosperous.
3. Under this bill the ordinary freight steamers, which carry 80 or 90 per cent. of our agricultural exports, will get but a fraction of the amount of subsidy which the passenger steamers would receive, although the latter carry less than 10 per cent. of our agricultural exports.
4. Under this bill a ship can run practically in ballast and draw subsidy. We believe that when freight is not promptly offered it will pay a certain class of ships to run empty rather than to wait for cargo.
5. This bill would tax all our citizens to provide extra profits for a favored few in this favored industry.
6. The professions of this bill are insincere and its principles are unsound. We believe that the best interests of this nation do not demand the passage of this or any similar bill.

ACTIVITY IN PACIFIC COAST SHIP YARDS.

There is considerable activity in ship building on the Pacific coast. Numerous new craft, built for the Alaska trade, are the center of interest. Owing to the high price of material and limited capacity of iron ship yards, and particularly the difference in cost between metal and wood, nine-tenths of the new craft are constructed of Washington and Oregon fir.

Among the new steam schooners that have been fitted with temporary passenger accommodations is the Robert Dollar, the largest steam schooner yet built on the west coast. She has a lumber capacity of 750,000 feet. The steamer Santa Ana, built in Oregon, has triple expansion engines, 13, 23 and 38 inches diameter with 30 inches stroke, made by the United Engineers Works of San Francisco, a young but growing concern which is making a specialty of marine work and which is under the necessity of enlarging its plant owing to the increase of its orders. The tug Meteor is another new production, built for use of the Alaska Exploration Co., in the vicinity of St. Michaels. She is 85 feet over all, 16 feet beam and 6 feet 2 inches depth of hold, with compound engines built by the United Engineers Works, and Scotch marine boilers, built by the Keystone Boiler Works. She has had her trial trip and is ready for sea.

The Nome City, the most pretentious of the new craft, was built by Dixon of Oregon—his one hundredth hull. She is of good model, substantially built, planked solid to the spar deck, with modern conveniences, and all available cabin space that she can have, the staterooms covering three-fourths of the spar deck. The main deck will be used in these early trips in Nome trade for second-class passengers somewhat, but mostly for cargo. Numerous large head lights supply ample light between decks. This vessel is equipped with engines of 13, 23 and 38 inches diameter and 30 inches stroke, and Babcock & Wilcox boilers. On the whole the Nome City is one of the finest wooden combined passenger and freight steamers yet built on this coast.

The Californian for the American Hawaiian line (main office in New York), built by the Union Iron Works, San Francisco, was launched last Saturday. The same company has contracted with the Union Iron Works for another steamer to be 489 feet on the water line.

The ferry boat contracted for by the Santa Fe railway with the Union Iron Works is not yet in frame, but much of the material is ready and shortly will be set up in the stocks. The steamer is intended almost exclusively for passenger service and will have all modern improvements. The Union Iron Works have plans for a new addition to the Sauciloto line in the shape of a ferry.

Capt. Scott and others of Seattle are building a new screw passenger steamer for the Seattle-Everett route, which will be about 125 feet on the waterline and 22 feet beam.

A branch office has been opened in Denver, Col., by the Bethlehem Steel Co., with Mr. C. S. Burt in charge. Mr. Burt was formerly president of the C. S. Burt Co., Ltd., of New Orleans. The latter company will continue to represent Bethlehem interests in New Orleans, but Mr. Burt's health having obliged him to change climates, he has established an office in the Bank block, Denver, and the Bethlehem company has arranged with him to look after their affairs in that city.

The Nickel Plate road offers special low rates to Milwaukee, Wis., account biennial meeting General Federation of Women's Club. Tickets sold June 1 to 4 inclusive; good returning until June 11, or by deposit until June 30 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 68 June 4.

MECHANICAL VENTILATION AND HEATING.

BY WALTER B. SNOW.*

In the combined process of heating and ventilating, a specific amount of heat is in all cases required to compensate for transmission losses to the colder outdoor atmosphere, and a certain other quantity to provide for the warming of all air which intentionally or otherwise enters the room from without. The former amount varies with the character of the construction and the difference between indoor and outdoor temperatures. It is independent of the volume of air supplied for ventilation. The amount of heat required for tempering the air supply for ventilation alone is directly proportional to its volume, and is that necessary to raise it to the temperature of the room. This is in no way available for heating, but it is all important in securing satisfactory ventilation, which, when properly provided, grows effective in proportion to the expenditure.

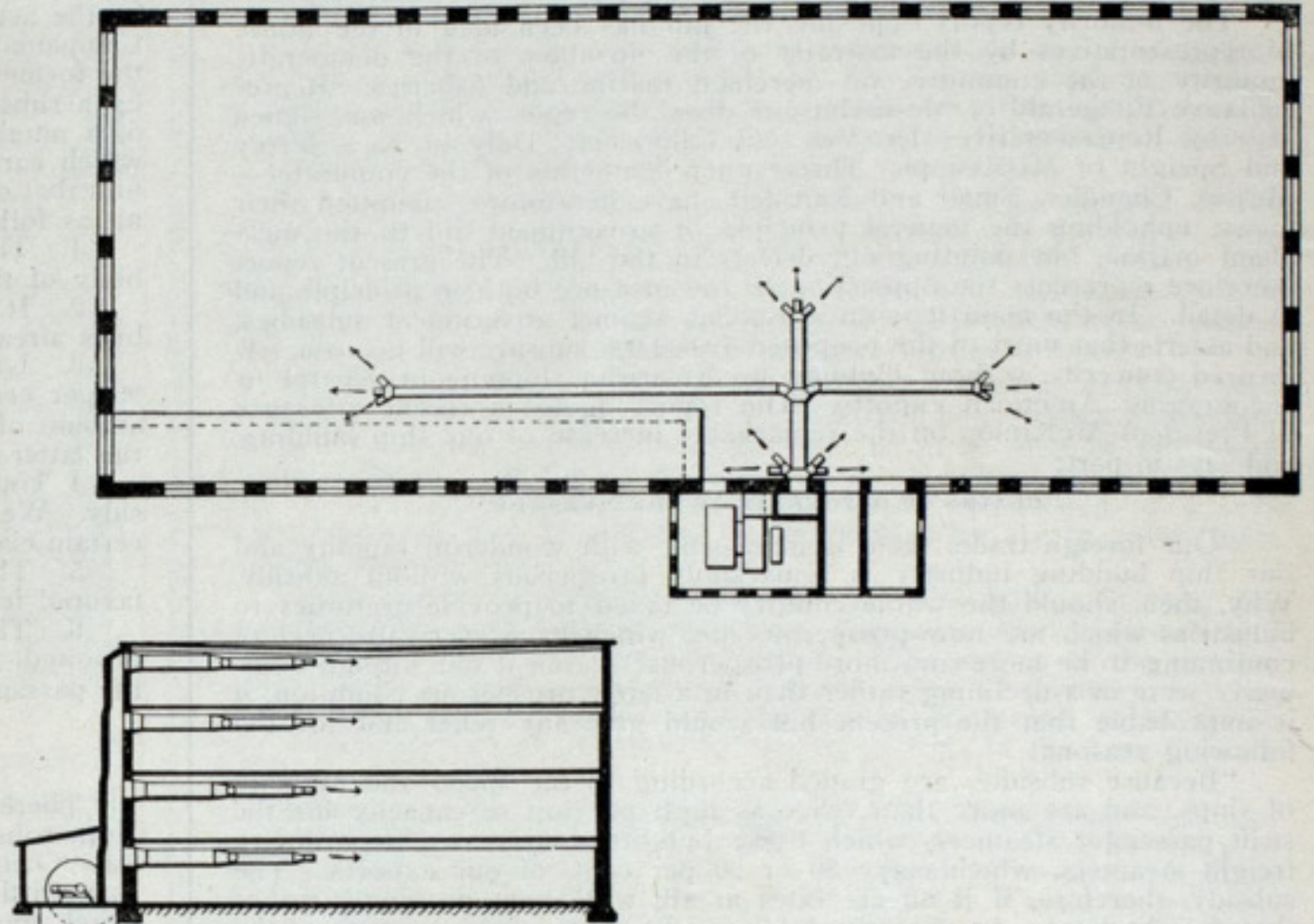
It is manifest that air may readily serve as a vehicle for heat for maintaining the desired temperature within an apartment. Evidently the air must be preheated, and therefore the plenum with the blower system, which is that here described, or pressure method of supplying is preferable to the vacuum or exhaust method. All local or direct heating surface is eliminated from the rooms and may be massed in connection with the fan, thereby greatly simplifying the details of installation. The heating surface thus provided almost universally takes the form of a steam coil, built up in sections and enclosed in a steel plate casing through which the air is passed by the action of the fan.

The pipes, usually 1 inch in size, are here set $2\frac{1}{8}$ inch on centers, thus providing a free area for passage of air equal to about 40 per cent. of the gross area of the face of the section. The air passing through such a heater must be warmed by a contact. The increment due to radiation is very slight. Therefore the arrangement of pipes which thoroughly breaks up all currents best serves the purpose by insuring intimate and constantly changing contact. The compactness of this construction is shown by the fact that within the space measured by 6 feet in length, 7 feet in height and $7\frac{1}{2}$ inches in thickness there may be massed nearly 1,000 lineal feet of 1-inch pipe. Such construction readily lends itself to manifold arrangements in connection with fans of various types. The most important feature of this type of combined heating and ventilating apparatus, familiarly known as a hot-blast apparatus, lies in the fact that the rapid movement of air across the heated surfaces renders them vastly more efficient than when exposed in still air. In other words, far less surface is required for the same heat transmission.

In a hot blast apparatus consisting of a fan and heater like that illustrated herewith the heat transmission when the air velocity is 1,200 feet per minute is on the average about 10 B. T. U., or over five times as much as in the case of direct radiation. That is, a hot blast apparatus need contain only one-fifth the surface required to secure a given result with direct radiation.

The design and manner of application of such an apparatus, and the method of air distribution employed in this system must of necessity depend upon the character of the building, its surroundings and its uses. The ordinary structure devoted to manufacturing purposes presents the simplest of all problems. As a rule the per capita space for the operatives is large, and the heating is to be considered as of paramount importance, while the ventilation, although sufficient with the blower system, is in a sense incidental. In fact, ample ventilation may usually be secured

In a wooden structure, or in one of brick or stone which is already built, such distribution must be made by means of galvanized iron pipes. The simplest possible arrangement consists of a single upright galvanized iron flue, immediately beneath which the apparatus is placed so as to deliver the air directly upward into the base of the flue. Upon each floor the requisite number of outlets are provided, at or near ceiling level and the air discharged therefrom towards the outer walls. As the building becomes more extended in its character it becomes necessary with a single standpipe system to somewhat extend the branches so as to convey the air to a greater distance from the standpipe. The apparatus is here placed in the basement and discharges directly upward into the standpipe. Upon the first floor the branch pipe is extended and subdivided so as to heat the individual offices on that floor, while upon the other floors the horizontal branch is only of moderate length. In a long

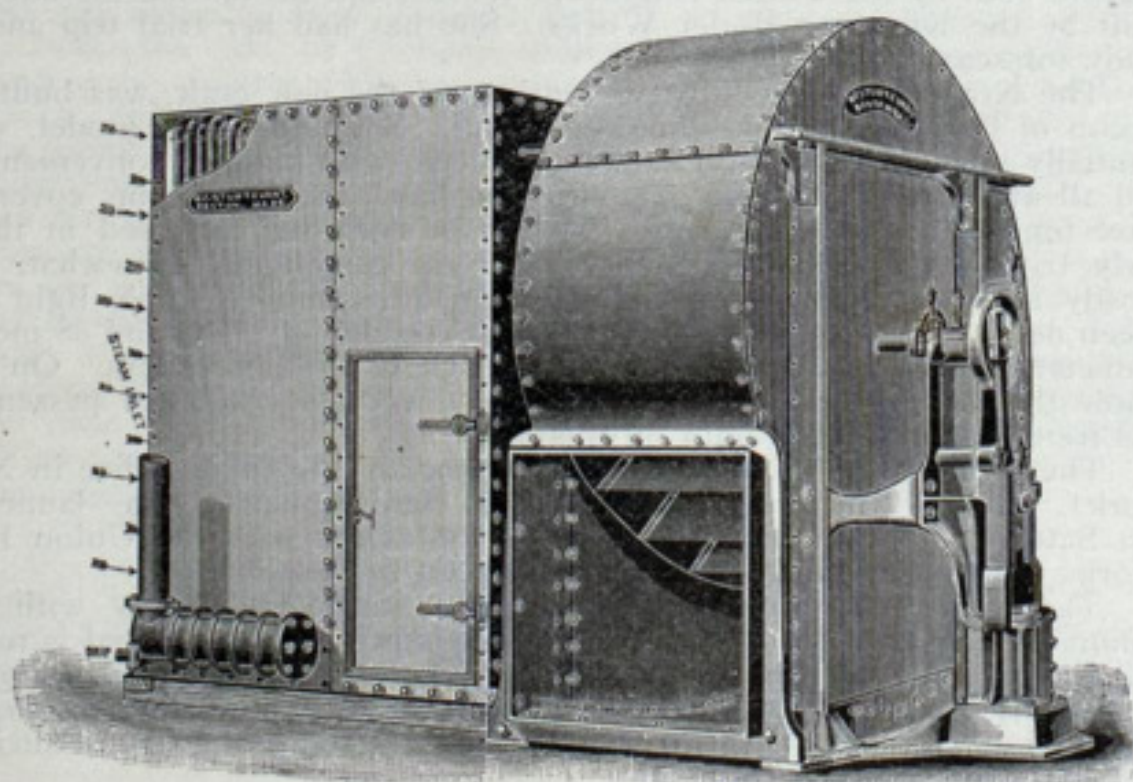


APPLICATION OF THE BLOWER SYSTEM OF HEATING AND VENTILATION.

building in which a single standpipe is adhered to a greater extent of the piping system on each floor may be made. Thus the standpipe may be carried up outside of the building, but thoroughly protected, and the horizontal pipes on the various floors kept comparatively near the wall.

In a new brick building convenience can be secured by distributing the air from one or more brick flues built against the wall of the building. If these are provided in sufficient number they require no distributing pipe connections, but if economy is sought by providing a single flue, then it becomes necessary to obtain satisfactory distribution on each floor in some such manner as is shown in the illustration, in which an individual system is provided at the ceiling of each floor. Where the building is of less extent a special deflecting outlet may be placed upon the opening in the flue on each floor and serve to effectually distribute the air.

In a new brick building of reasonable size the best arrangement consists in building a series of pilaster flues against the outer wall along one side of the building, from each of which the air is discharged toward the opposite side through openings at eight or more feet above the floor. The apparatus is usually placed in the basement, near the center of the building, and discharges the air into a duct running along one side of the building, and communicating with the bases of the flues. These flues add but little to the cost of the building. Each opening or outlet is provided with a special form of damper which serve the double purpose of deflecting the air toward the room when open and of preventing admission when closed. The equality of temperature maintained by this system is evidenced by the accompanying average results and readings taken at random from a record kept at the west weave shed of the Pacific Mills, Lawrence, Mass.:



STURTEVANT HEATING APPARATUS WITH THREE-QUARTER HOUSING STEAM FAN

by allowing the fan to draw its supply from the building itself, thereby simply turning the air over and over, and merely adding to it the heat necessary to offset the transmission and leakage losses. To this end it is most desirable that the apparatus be placed as near the center of the building as possible, so that the air may be drawn back to it from all sides. Such location also simplifies the distributing system and reduces the cost. From the apparatus the air may be conducted by underground ducts or overhead pipes to its proper destination.

In buildings of more than one story the simplest arrangement for heating consists in placing the apparatus on the lower floor or in the basement, and delivering the air into one or more vertical flues from which it is discharged through suitable outlets upon the several floors.

*Abstract of a lecture delivered at Cornell University. Mr. Snow is of the engineering staff of the B. F. Sturtevant Co., Boston.

DATE.	TIME.	TEMPERATURE.					HUMIDITY.
		East End.	MIDDLE.			West End.	
			Floor.	High Head.	Ceiling		
1889.		Degrees	Degrees.	Degrees.	Degrees.	Degrees.	Per Cent.
Feb. 7.....	9.15 A. M.	70	70	70	71	68	65
Feb. 7.....	1.15 P. M.	68	69	68	70	66	64
Feb. 7.....	6.15 P. M.	70	71	71	72	66	64
Feb. 8.....	6.45 A. M.	70	69	71	73	66	61
Feb. 8.....	2.45 P. M.	73	74	75	76	72	68
Feb. 9.....	7.25 A. M.	70	69	71	72	66	75
Feb. 11.....	10.30 A. M.	68	68	69	68	68	75
Feb. 11.....	5.30 P. M.	72	72	73	72	69	63
Average.....		70.12	70.25	72.25	71.75	67.64	67.12

The particular features of this combined system of ventilation and heating may be thus summarized: The entire heating surface is centrally located, enclosed in a fireproof casing and placed under the control of a

single individual, thereby avoiding the possibility of damage by leakage or freezing incident to a scattered system of steam piping and radiators. The heater itself is adapted for the use of either live or exhaust steam, and provision is made for utilizing the exhaust of the fan engine, thereby reducing the cost of operation to practically nothing. At all times ample and positive ventilation may be provided with air tempered to the desired degree. Absolute control may be had over the quality and quantity of air supplied. It may be filtered and cleansed, heated or cooled, dried or moistened at will. By means of the hot and cold system the temperature of the air admitted to any given apartment may be instantly and radically changed without the employment of supplementary heating surface.

The pressure created within the building is sufficient to cause all leakage to be outward, preventing cold inward drafts and avoiding the possibility of drawing air from any polluting source within the building itself. By returning the air, using live steam in the heater and operating the fan at maximum speed, a building may be heated up with great rapidity, as is usually desirable in the morning. The area of heating surface is only one-third to one-fifth that required with direct radiation, while the primary cost and operating expense of a fan is far less than that of any other device for moving the same amount of air. The system is essentially a necessity in buildings occupied as halls of audience, and may be readily introduced in the mill and the factory. The increasing extension of electric power and fuel gas distribution is making possible its application in all classes of buildings. Full appreciation of its advantages is therefore the best guarantee of its introduction.

SENATOR LODGE ON NAVAL INCREASE.

Senator Lodge sounded a note of warning in the senate the other day. He held it to be imperative that the navy should be increased as rapidly as possible, as war with a foreign power may be one of the events of the future. He did not say that war was probable, but that it was a possible contingency that should be reckoned with. He held that the maintenance of the Monroe doctrine, which is inseparably linked with American dominion of the western hemisphere, might some day involve the country in war. Indeed, it is more likely to involve the country in war without a competent navy than with one. He urged that the building of battleships should not be suspended because there was some difference of opinion regarding the price of armor. Among many things he said:

"I think that the safety of the United States rests upon its naval strength. It is not on account of the new possessions that I am led to urge this. Far from it. I do not think that a single one of the new

Members of Grand Lodge, Ship Masters' Association.



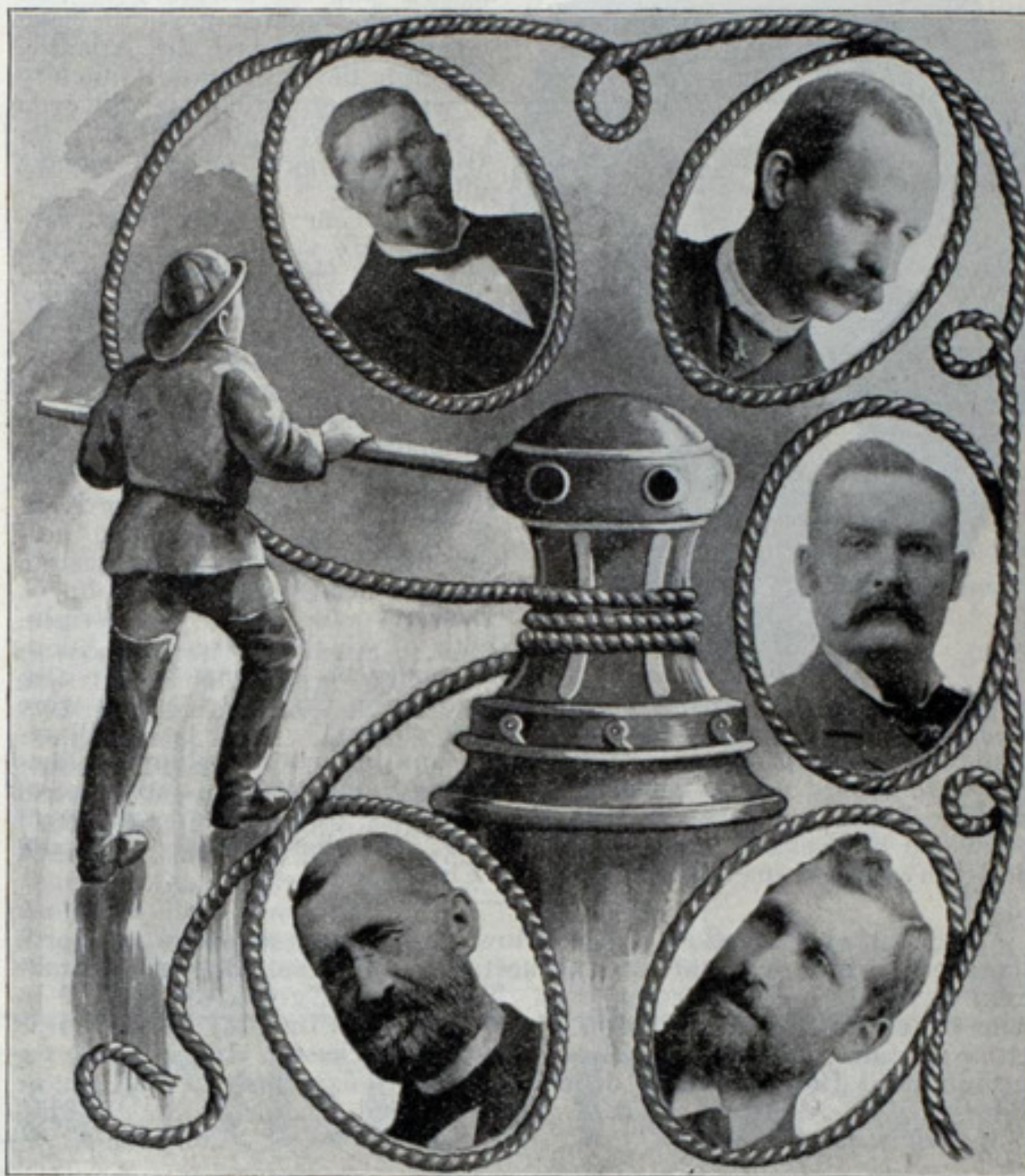
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D. C. Sullivan.

(From the Association Directory.)

possessions adds to or diminishes the need of a powerful navy. The danger to the United States lies where it has always lain, in our own coast, and in the interests which we must always protect in this hemisphere. We have the largest coast line of any nation in the world, and one of the smallest fleets. We are about to undertake the construction of an isthmian canal. Whether it is better to fortify that canal or to leave it unfortified, it is not necessary for me to discuss. To control that canal, to defend

it, to hold it open for our commerce and for the commerce of the world, even against an enemy's fleet, we must be the naval masters of the Caribbean sea. We must have a far more powerful fleet than we have today. The safety of the canal rests on the American fleet. Everybody knows that this canal ought to be built, and the time is very near, in my judgment, when the work will be undertaken. If we are to be responsible for this canal, in addition to our own coast, we must have a fleet proportionately strong. I hope and believe that we shall have no war with anyone, but the surest guarantee that we shall have no war will lie in the possession of a fleet which no one would wish to attack. It is the

Past Presidents, Ship Masters' Association.



Alex. Clark, Buffalo. C. E. Benham, Cleveland.
Geo. McCullagh, Detroit.
W. E. Rice, Port Huron. Henry Lelsk, Milwaukee.

greatest insurance for the peace of the country, for the protection of our coast and for the maintenance of the canal that can be devised.

"I may say that I hope and believe there will be no war with anyone; but we should be foolish indeed if we closed our eyes to the possibility of the situation. We can never allow these Danish islands to pass into any hands other than those of their present possessor except our own. The nations of Europe that would undertake to take possession of these islands and hold them, right there on the road to the canal, to make of them great naval stations and places of arms would be, by that very act, the enemy of the United States. It would be impossible for us to submit to any such thing as that. The Monroe doctrine is the greatest protection of the United States. To that we all, without distinction of party, adhere. I am by no means confident that some European power (perhaps one whose navy is just now receiving such a rapid increase) may not test that doctrine, that we may not find ourselves called upon to protect Brazil or some other South American state from invasion, and that we may not be called upon to see to it that no new European state is established on the continent of South America. I am not conjuring up imaginary dangers. I trust that no act will be committed that will result in war. But I am sure that the way to prevent any such infringement on the Monroe doctrine, the way to prevent peaceably the seizure of any part of the South American continent or of the West Indian islands by any European power is to have a navy which no power in the world can afford to disregard.

"There are no people in this country—north, south, east or west, Democrat or Republican—who do not believe in constructing a navy powerful enough for the defence of our coast and for the maintenance of the Monroe doctrine. That is one question on which I believe all Americans are agreed; for they all feel that in the navy rest, more than any other thing, the peace and security of the country. It is for these reasons that I feel so deeply the necessity of avoiding anything in the way of delay. I do not want to pay these armor plate companies \$1 of their extortionate profits; but I do want the department to be able to get armor to build ships, even if we are building an armor plant at the same time. If trouble should come, if the Monroe doctrine should be attacked, if our coasts should be in danger, we would find it but a poor reply, when short of ships to say: 'Well, at least we have kept an egregious monopoly out of extortionate profit.' It is better to be forehanded in such things. It is better to take the part which will lead to an immediate construction of the navy; and that means the adoption of the amendment reported by the committee on naval affairs. Under that amendment we have an opportunity to get armor anywhere, if a reasonable price be accepted, and if not, we will build our own plant. Therefore, I sincerely trust that no one will try to postpone the building of ships."

CAPT. CHARLES GALE.

Only a few of the ship masters of the great lakes who were in command of sailing vessels back in the thirties are still living. One of them is Capt. Charles Gale, whose home of late years has been at Sombra, Ont. Some of his associates of early days have undoubtedly been much interested in reading his communications to the marine journals. He



delighted in writing of the voyages of sailing vessels from the lakes to European ports, which were quite common in his time. He made several such voyages himself and his memory is still quite clear regarding all the lake vessels that crossed the Atlantic, although he finds more difficulty in writing now than he did even a year or two ago. Of his own Atlantic voyages he still retains full records.

Capt. Gale is eighty-six years of age. He was born in Chicago, when that city was not of much account from a marine standpoint. He began sailing very early in life. The first vessel in which he was interested was the Comet, a Canadian sailing craft, which he purchased jointly with Capt. Joseph Fox about 1841. In later years he built and sailed for Handy & Warner of Cleveland vessels that were among the best of the lake fleet, notably the John G. Deshler and John B. Wright, both of which crossed the Atlantic under his command. He also

sailed vessels of the Northwestern Transportation Co.'s fleet, which were the forerunners of the wooden type of ore carriers. Capt. Gale still retains the friendship of men of prominence and influence in shipping lines who were aboard vessels when he was sailing; among them Capt. Coe of the Cleveland City Forge & Iron Co., who has always manifested great interest in his welfare. Capt. John Varner, a brother of Capt. Gale, and himself a very old man, is still living in Cleveland.

The Nickel Plate road will sell low rate excursion tickets to North Manchester, Ind., account annual meeting of German Baptists (Dunkards) at one fare for the round trip. Tickets good going on May 29 to June 4 inclusive, beyond a radius of 100 miles, and on May 31 to June 8 within a radius of 100 miles from North Manchester, Ind. Good returning until June 10, or by deposit until July 5 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 67 June 4.

PULSATING PUMP.

We show herewith one style of a line of pulsating pumps built for various purposes by Macleod & Clark, 457 Front street, Cincinnati, O. The pump consists of two chambers, connected with the steam pipe at the top by a butterfly valve. A common admission chamber, with separate valves for each chamber, connects with the suction pipe below and is inspected by taking off the lower hand-hole shown in the cut. Separate outlet valves at the bottoms of the chambers connect with a common discharge pipe and are adjusted through the upper hand-hole, shown at the side of the pump.

The action of steam admitted by the top valve depressing on the surface of water, forces the water up the rising main; immediately the chamber is emptied of water, condensation takes place, creating a vacuum, pulling over the top valve and drawing in the next charge of water. While this is being done, the other chamber is being emptied the same way, thus when one chamber is drawing the water the other is being emptied, the pulsations being so rapid as hardly to be detected in the water delivered. The manufacturers claim that this pump uses less steam than any piston-driven pump for lifts up to 80 feet, as the steam is used at pressure to empty the chamber and the condensation of steam is utilized to fill it, while the absence of moving parts (except the valves) reduces friction to a minimum. It is especially recommended for bilge and wrecking use, as it will handle quick sand, gritty water, etc., and is also valuable for ballast pumping, washing down and many other uses about a ship, dry dock or wrecking plant.

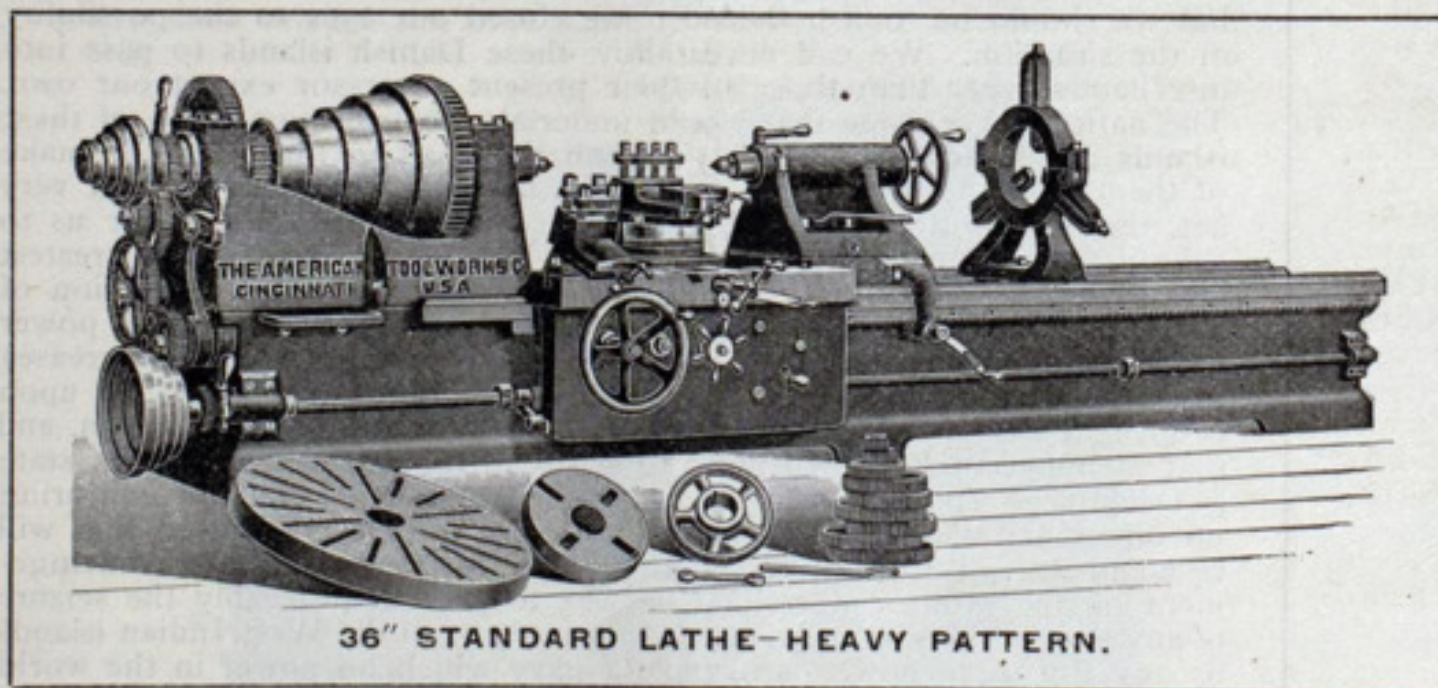


The Cleveland offices of Manning, Maxwell & Moore, in charge of Frank B. Ward, have been removed from S. Water street to the suite 1618-1620 Williamson Bldg., Euclid avenue and Public Square. The lines represented are electric traveling cranes, air compressors, pneumatic hoists, cranes and riveters, and complete machine shop and foundry outfits.

CHARTS OF THE ST. LAWRENCE.—It frequently happens that owners of steam yachts passing between the lakes and the Atlantic want charts of the St. Lawrence river, and want them in a hurry. The Marine Review has them on hand all the time—complete from Lake Ontario to the Gulf of St. Lawrence.

BACK NUMBERS OF THE REVIEW.—Liberal subscription extensions will be made by the Marine Review for issues of Jan. 21, 28 or Feb. 4, 1897, or July 21, 1898.

Tools for Economical Production.



36" STANDARD LATHE—HEAVY PATTERN.

We build complete lines of Machine Tools for machine shop equipments, viz:

Lathes, Planers,
Drills, Shapers,
Boring Mills, Etc.

Investigate our lines before buying.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway,
Geo. Place, Agent.

NEW ORLEANS: The Fairbanks Co.

CHICAGO STORE: 68-70 South Canal Street.

PHILADELPHIA: The Fairbanks Co.

CLEVELAND: The Strong, Carlisle & Hammond Co.

BOSTON STORE: 36 Federal Street.

BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.

DENVER AND SALT LAKE CITY: The Mine & Smelter
Supply Co.

LONDON: Alfred Herbert, Ltd., 7 Leonard St.,
Finsbury, E. C.

DÜSSELDORF: de Fries & Co., Act. Ges.,
Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Freres, 33 Rue des Peignes.

BERLIN: de Fries & Co., Act. Ges.,
Kloster Strasse, 13-15.

PARIS: Roux Frères & Cie., 54 Boulevard
du Temple.

MOSCOW: Alfred Stucken.

TRADE NOTES.

Mr. A. Beaudry of Beaudry & Co., Boston, Mass., manufacturers of the Beaudry champion power hammer, has been visiting Chicago and other western points. He returned to Boston with some nice orders. The merits of the Champion hammer recommend it to the trade.

The Ball Bearing Co., Boston, Mass., manufacturers of high-grade ball and roller bearings for all kinds of machine construction, shafting, etc., has just issued their "Twentieth Century Catalogue." The cut of a child on front cover shows a wonderful development from that of the infant shown on cover of previous issue, illustrative of the great development of the company's business during the past year. The factory facilities of this company are being greatly enlarged to meet the growing demand for their product.

An interesting test of a piston air drill, just put on the market, was made recently at one of the United States navy yards. A block of thoroughly-seasoned yellow pine, 18 inches square, was used for the test. Into this a hole 5½ inches in diameter was bored by the drill. The drill is reversible and can be operated with equal facility forward or backward. It weighs 12 pounds and is especially adapted for wood boring. A screw feed attachment permits of its use for light drilling and reaming in iron and steel. It is meeting with great favor in the railroad shops, ship yards and factories. The drill is known as the Chicago No. 14 and is manufactured by the Chicago Pneumatic Tool Co.

J. A. Fay & Co. of 150-170 West Front street, Cincinnati, manufacturers of wood-working machinery, have just issued a very handsome and complete illustrated catalogue of 394 pages showing the different machines they make, and will be pleased to forward a copy to any manufacturer or foreman who is interested in that class of machinery. A large number of machines described have been patented in 1900 and embody the latest designs and inventions in the wood-working machinery industry. An experience of nearly three-quarters of a century is back of this company's operations. No less than twenty-eight of the machines above referred to have been protected by letters patent since Jan. 1, 1900. The company's large technical department, presided over by Thomas P. Egan, president, is in the main responsible for these improvements.

Thomas Drein & Son of Wilmington, Del., have the following list of orders on the Atlantic coast for their patent beaded steel bottom metallic life boats, of the type that received approval of the board of supervising inspectors of steam vessels in Washington, Feb. 17, 1900: For the steamer Sierra, six 26-foot boats and three ocean life rafts; Ventura, six 26-foot boats and three ocean life rafts; for the International company, twenty-four 26-foot boats and twelve ocean life rafts; for the two Cuba Mail steamships, twelve 26-foot boats and nine ocean life rafts; for new steamers of the Philadelphia & Baltimore line, four 18-foot boats; for a Boston steamer, two 18-foot boats; New York steamer, two 22-foot

boats, and for a Boston ferryboat, one 16-foot boat. Orders from the great lakes include the following: Steamer William Edenborn, two 22-foot boats; for Bessemer Steamship Co., four 22-foot boats; Lehigh Valley Transportation Co., two 24-foot square-stern boats; for a Chicago steamer, four 22-foot boats; West Bay City steamer, two 22-foot boats; Cleveland steamer, two 22-foot boats; besides several outfits of cork life preservers.

IN THE LAKE COUNTRY

of Northern Illinois, Wisconsin, Minnesota and Michigan there are hundreds of the most charming summer resorts awaiting the arrival of thousands of tourists from the south and east. Among the list of nearby places are Fox lake, Delavan, Lauderdale, Waukesha, Oconomowoc, Palmyra, the Dells at Kilbourn, Elkhart and Madison, while a little further off are Minocqua, Star lake, Frontenac, White Bear, Minnetonka and Marquette on Lake Superior.

For pamphlet of "Summer Homes for 1900," or for copy of our handsomely illustrated summer book, entitled "In the Lake Country," apply to nearest ticket agent or address with four cents in postage, George H. Heafford, general passenger agent, Old Colony building, Chicago, Illinois. May 24.

The Nickel Plate road offers low rates to Des Moines, Ia., account annual convention Music Teachers' Association. Tickets good going June 17 to 21 inclusive, and good returning not later than June 23, 1900, at one fare for the round trip. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 83 June 14.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.
Quotations furnished by HERBERT WRIGHT & Co., Cleveland,
date of May 16, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	34	35¾	33¾	35½
American Steel & Wire, Pfd.....	75	75¾	75	75½
Federal Steel	35¼	36¾	34¾	36
Federal Steel, Pfd.....	65¼	65¾	65	65¾
National Steel	27¾	30¼	27½	30¼
National Steel, Pfd.....	.....	.....	.....	.....
American Tin Plate	23	23	22½	22½
American Tin Plate, Pfd.....	75	.....	.....	75
American Steel Hoop.....	21¼	22	21¼	22
American Steel Hoop, Pfd.....	69¾	.....	.....	69¾
Republic Iron & Steel	14¾	14¾	14¾	14¾
Republic Iron & Steel, Pfd.....	56	56	55¾	55¾

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAUT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS**, **SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY**, **AMIRAL AUBE** and **MARSEILLAISE**.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH**, **AUSTRALIEN**, **POLYNESIEN**, **ARMAND-BEHIC**, **VILLE-DE-LACIOTAT**, **ERNEST-SIMONS**, **CHILI**, **CORDILLERE**, **LAOS**, **INDUS**, **TONKIN**, **ANNAM**, **ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS**, **CAEN**, **BREST**, **CHERBOURG**; Fast Steamers **TAMISE**, **MANCHE**, **FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR**, **ARROGANT**, **FURIOUS**, **VINDICTIVE**, cruisers; **NIOBE**, **DIADEM**, **ANDROMEDA**, **EUROPA**, cruisers; **GLORY**, **GOLIATH**, **ALBION**, **OCEAN**, iron clad ships; **ARGONAUT**, **ARIADNE**, **AMPHITRITE**, **SPARTIATE**, **HERMES**, **HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR**

and **ROSARIO**, sloops; **CRESSY**, **ABOUKIR**, **SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE**, **FORMIDABLE** and **IRRESISTIBLE**, **VENERABLE**, **LONDON**, **BULWARK**, iron clad ships; **EURYALUS**, **BACHANTE**, cruisers; **MUTINE**, **RINALDO**, **SHEARWATER**, sloops; **CORNWALLIS**, **DUNCAN**, **EXMOUTH**, **RUSSEL**, iron clad ships; **DRAKE**, **KING ALFRED**, **LEVIATHAN**, **AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX**, **KENT**, cruisers; **ALBEMARLE**, **MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X'**, **X'''**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER**, **CORYELL**, **WILD DUCK**, **SULTANA**.

Cable Address: BELLEVILLE SAINT-DENIS-SUR-SEINE.

General Information Sent on Demand.

A DISCLAIMER FROM BUFFALO.

LAKE FREIGHT SITUATION SAID TO BE BETTER THAN IT WAS A MONTH AGO—
MILES OF ICE IN THE MIDDLE OF MAY.

Buffalo, May 16.—As one of our Buffalo dailies has been incautious enough to copy a wail from Chicago to the effect that the lake trade is flattening out and that the bottom is already as good as gone, it may be well to put in a disclaimer at once and I will do so by saying with all possible emphasis that as far as this end of the lake trade is concerned there is much less fear of disaster than there was a month ago and that practically every vessel owner or broker here feels that the worst is as good as over. Freights in all directions are strong, unless it be lumber, which has really been the cause of all the weakness, so far as this port is concerned.

It is, of course, confessed that the turn of the freight market has been a great disappointment and it may be said also that with one view of the situation what is lost is lost, but the vessel interest is so confident of the future that there is everywhere a prediction that a standstill now means a freight so much better in the last half of the season. Some of the lumbermen frankly express much the same opinion, but at the same time they say that the eastern lumber trade is not anticipating its wants to the extent of a single board, and so long as there is where all the difficulty comes in they have nothing to do but to imitate the tactics of their customers. If they have to pay \$4 again in the fall they will do it.

The fight over lumber rates is not over, but vessel owners are standing firm and say that there is indication of an improvement, though some of the dealers are still trying to get tonnage at \$1.50 from Georgian bay on pine and \$2 from the Straits on hardwood. Other freights have done better by us. Up to Monday night this port had handled 20,212,340 bushels of all grain, including flaxseed, but not including the 987,040 bushels that the present management found afloat when it took hold. Ore is coming in fairly well. It must be understood that Buffalo, without its big steel works yet in operation, is now an ore-handling center of the first class, having passed Erie last season, and stands fourth on the list, with a trifle more than a tenth of the Lake Erie ore to its credit.

We have had all sorts of luck with the ice this season. As a rule it has been as mild and forbearing with us as possible and has sunk but one vessel, the schooner Howland, while the wet grain brought in may be summed pretty nearly up in brief by mentioning the 29,000 bushels on the Yale and about 17,000 bushels on the steamers Grover and Caledonia together. Some sort of permanent record ought to be made, however, of the fact that at the middle of May there was still several miles of ice off this harbor, with grounded "claspers" in many places so solid that a man could walk about on them as securely as on land. Inside of ten days of that time a vessel made its way a half mile or so through this sort of ice and then failed to get any further. Not being able to turn

about either, there was nothing to do but back out through the long groove that she had plowed in the ice. It was declared by a vessel owner at the middle of May that a stiff southeaster would easily close the harbor with ice. But the wind has so far stood on its neutrality and refused to drive the ice up or down, so, as the sun has been weak, there was nothing for the 100 miles or so of ice that lay at the harbor entrance when navigation opened but to make its escape down the Niagara and add to the picturesqueness of the Falls.

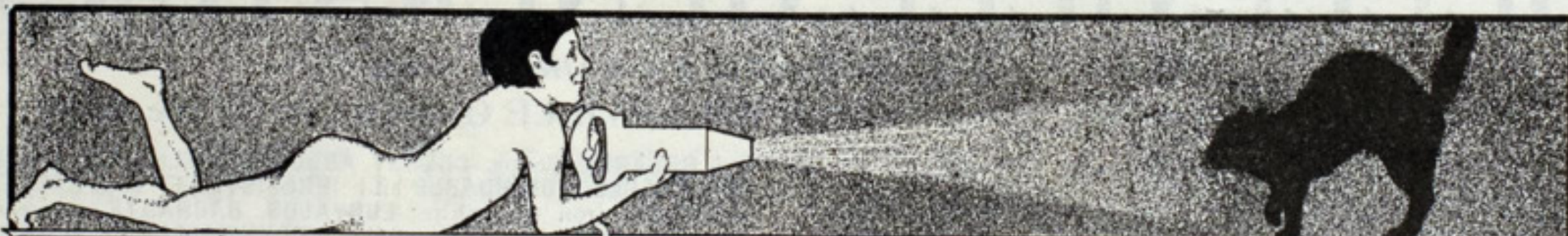
This port has not consented to be a strike center, as was feared, though the long fight at the Union Dry Dock Co.'s Works goes on and there may be a word from the package freight handlers yet. But the steady hand and good sense displayed on both sides in the arrangement with the scoopers had its moral effect, and we are safe, to all appearance.

NORTH ATLANTIC SQUADRON'S SUMMER CRUISE.

Admiral Farquhar, commander-in-chief of the North Atlantic Squadron, called at the navy department last week and had a conference with Secretary Long and Admiral Crowninshield respecting the summer movements of the squadron. The admiral's flagship, the New York, in company with the Texas, is now lying in Hampton Roads. It was arranged that upon leaving Hampton Roads the ships should proceed to New York, arriving there in time to give the annual salute off Grant's tomb, in Riverside Park, May 30. After some fitting out at the navy yard at New York, the New York and Texas will proceed to Newport, R. I., where the Kearsarge will join them, and the three ships, with the torpedo flotilla, will work out some of the plans of the naval war college, which will be in session at the time at Newport. This work will be undertaken about June 1. It will be concluded in time to enable the squadron to reach Boston before June 17 to take part in the celebration of the anniversary of the battle of Bunker Hill. The ships will then proceed to Portsmouth, N. H., where the citizens have arranged a celebration on August 6, during which they will present to the battleship Kearsarge a bronze tablet, the gift of New Hampshire. The project includes the presentation of a similar tablet to the Kearsarge's sister ship, Alabama, and the governor of Alabama will be invited to receive the tablet as a mark of the complete extinguishment of sectional feeling.

SUEZ CANAL STATISTICS.

United States Consul General Hunter, at Cairo, Egypt, sends to the state department statistics of the Suez canal traffic in 1899, which show that 3,480 steamers of 9,893,022 tons aggregate passed through the canal last year, as compared with a total of 3,464 vessels and 9,186,912 tons in 1898. Of the vessels passing through in 1899 2,207 of an aggregate tonnage of 6,628,767 tons were British, 373 of 1,051,149 tons were German, 223 of 591,142 tons were French, 205 of 438,175 tons Dutch, and 102 of 255,381 tons Austrian. Twenty steamers of an aggregate tonnage of 64,801 flew the flag of the United States.



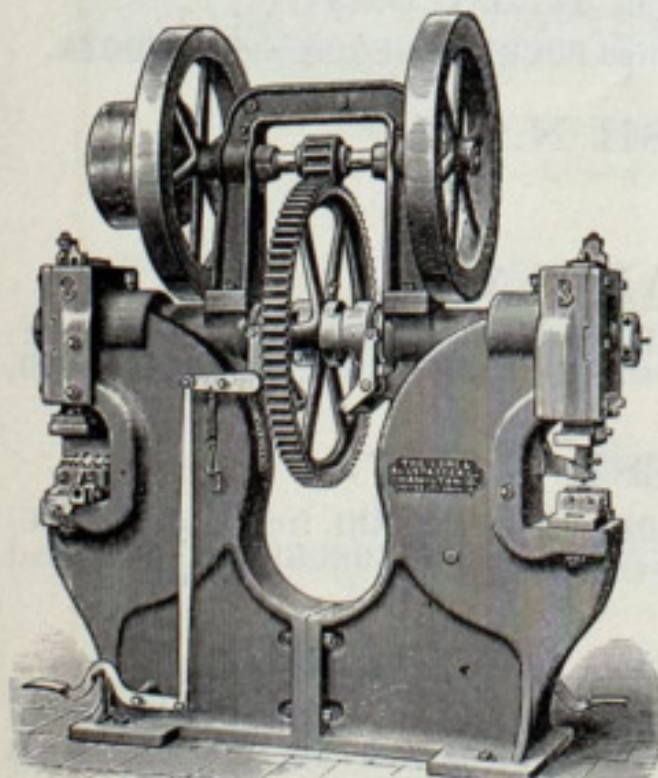
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CAN BE USED EVERY WHERE

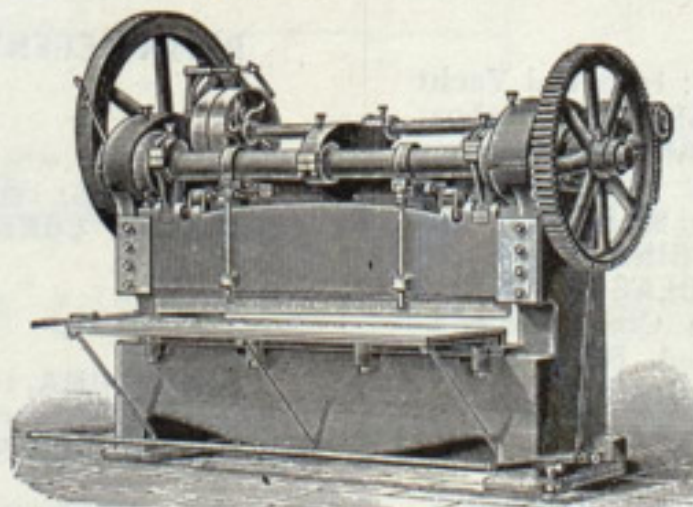
CHICAGO
NEW YORK

SEND FOR
CATALOG

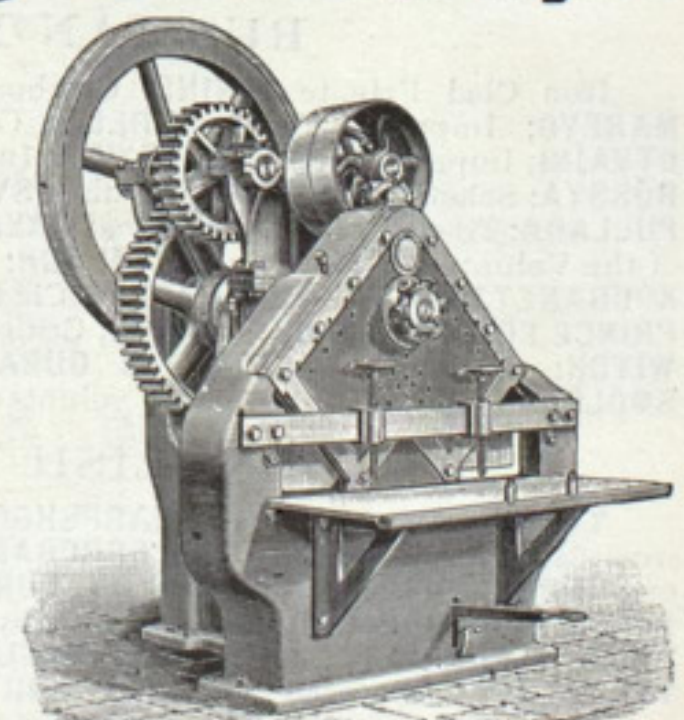


Punching and Shearing Machinery...

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Belt,
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Electric
Driven.



FOR SHIP YARDS, BOILER SHOPS, Etc.

MANUFACTURED BY

THE LONG & ALLSTATTER CO., HAMILTON, OHIO.

SHIP BUILDING IN THE DOMINION.

At the session of the Nova Scotia legislature, recently prorogued, an act was passed for the encouragement of ship building and manufacturing. Its provisions are: "On and after the first day of September, 1901, all machinery, stock in process of manufacture and manufactured, plant and tools in actual use in any establishment in the province of Nova Scotia established for the manufacturing of ships of iron or steel or any combination of metals of like character or for the manufacturing in iron or steel, shall be exempt from taxation for any purpose excepting for school, sewer or water rates, but said manufacturing establishment shall pay in lieu thereof a license fee equal to 1 per cent. of the assessed value of its real estate, in addition to the regular assessment on such real estate. All ships or shares in ships of iron or steel or any combination of metals of like character built and registered in the province of Nova Scotia shall be exempt from taxation for any purpose whatsoever for a period of ten years from the time this act shall come into force in any town, city or municipality."

Walter Dean, boat builder, 1751 Queen street, Toronto, has sent out a circular having reference to the different styles of steam, gasoline and electric launches built by him. The illustrations show perspective views of the different sizes and styles, deck plans, interior fittings, etc. Mr. Dean has built quite a number of these pleasure crafts during the past winter, which are now being delivered, one of the latest and most elegant being a gasoline launch for Edward Mahoney, Esq., Toronto, which is to be shipped to his island home in Muskoka, in a few days.

For a large steam tug which is now being built at Lunenburg, N. S., the New Burrill-Johnson Iron Co., Yarmouth, will supply the engines and boilers at a cost of \$11,000.

SUPPLEMENT TO THE IRON AND STEEL DIRECTORY.

The American Iron and Steel Association, No. 261 South Fourth street, Philadelphia, has compiled for the American iron trade, in the form of a supplement to the 1898 edition of its directory, a complete list of the consolidations of iron and steel companies which have taken place in the United States since Jan. 1, 1898. The list is confined to the consolidations which embrace the ownership of blast furnaces, rolling mills, steel works, tinplate works and auxiliary industries. The price of the supplement is \$2 per copy.

The change of time on the Nickel Plate road—Only a slight change at any of our stations. No. 4 leaves Chicago at 3:30 p. m. and departs from intermediate stations about thirty minutes later than formerly. Individual club luncheon and supper in dining car Chicago to Bellevue. Improvement in through sleeping car service both east and west. Club breakfast and lunch is served in dining car, Bellevue to Chicago on No. 1. Dining car service on Nos. 2 and 3 in both directions between Chicago and Buffalo. All trains daily. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 72, June 5

COLLECTOR GEORGE GOTT RETIRES.

George Gott, after twenty-seven years in the customs service at the port of Amherstburg, Ont., during the past sixteen of which he has been collector of the port, has at his own request been placed on the retired list, and Marwood Barrett of Colchester North has been appointed as his successor. Mr. Gott was an extremely popular collector and was highly respected by the lake carriers. He has been a resident of the district for sixty-three years, although a native of Halifax. Mr. and Mrs. Gott celebrated their golden wedding last November.

A Wells Case & Son of Highland Park, Conn., manufacturers of the Case outward thrust propeller wheel, say in a letter to the Review: "The advertisement in your journal is bringing us business."

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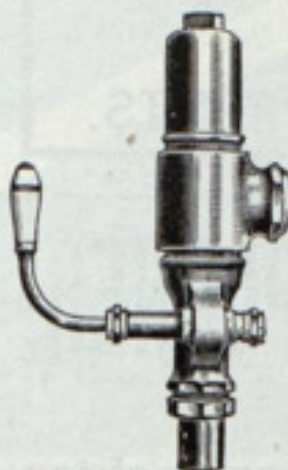
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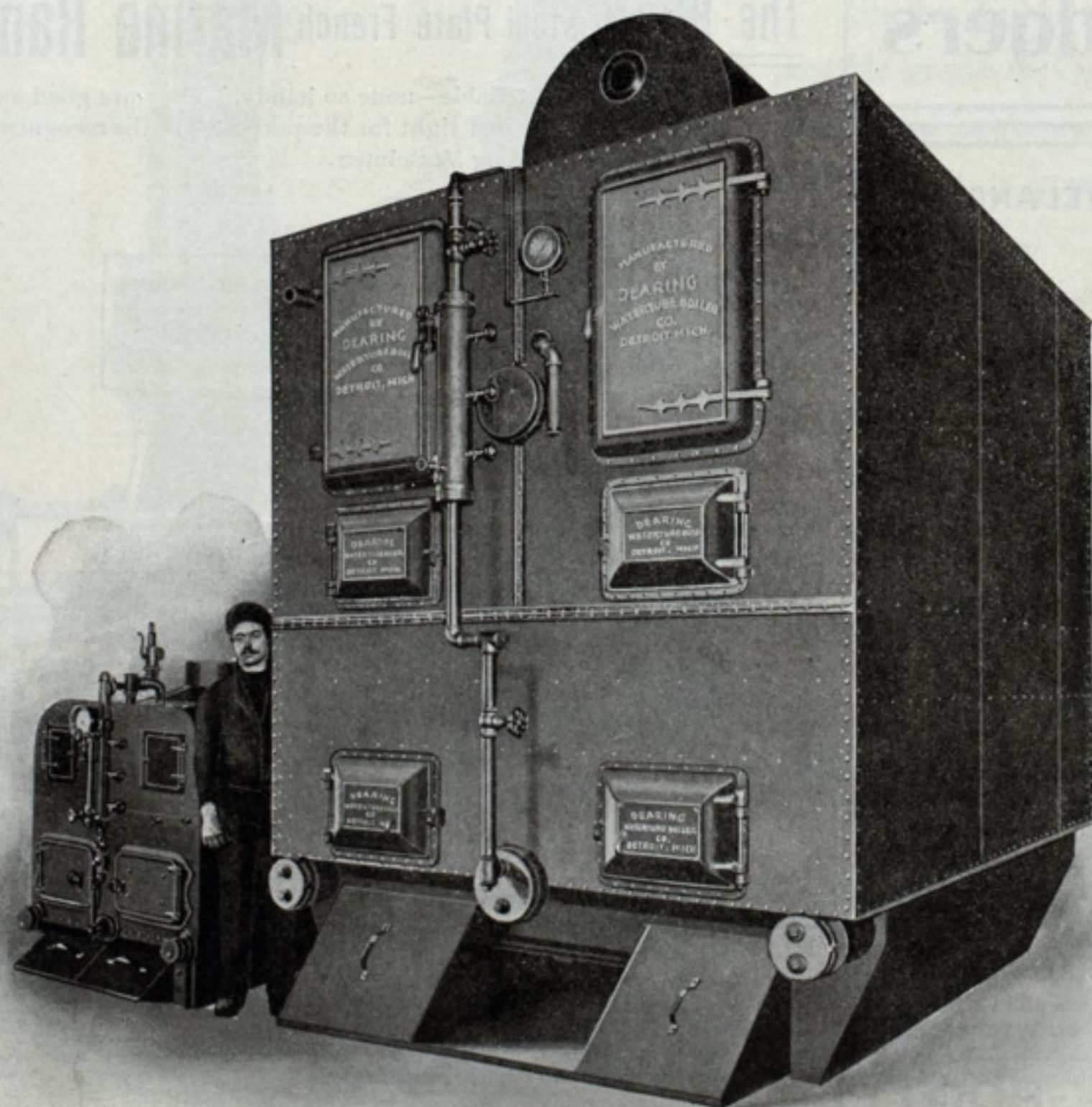
[Patented.]



Showing application of Flushometer.

U. S. Engineer Office, Customhouse, Cincinnati, O., May 16, 1900. Sealed proposals for hire of one or more Dredging Plants, each consisting of one Dredge, one Towboat and Three Dump Scows, for use on Ohio River, will be received here until 2 p. m., June 15, 1900, and then publicly opened. Information furnished on application. Wm. H. Bixby, Maj., Engrs. June 7.

U. S. Engineer Office, Buffalo, N. Y., May 1, 1900. Sealed proposals for construction of concrete superstructure on south pier at Buffalo, N. Y., will be received here until 11 a. m., May 21, 1900, and then opened. Information furnished on application. T. W. Symons, Major, Engrs. May 17.



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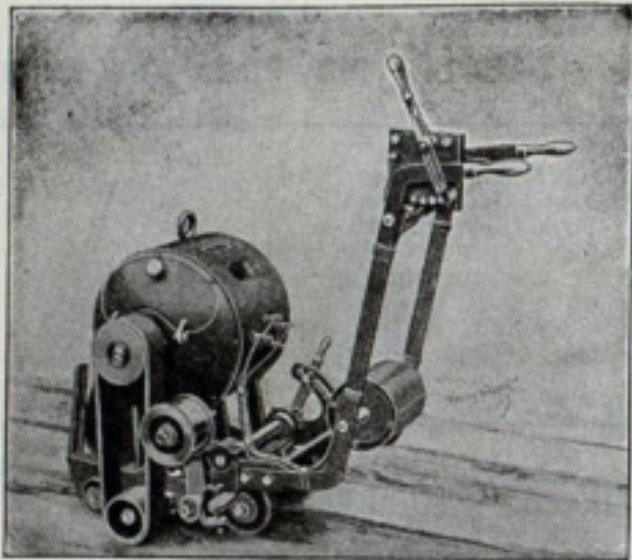


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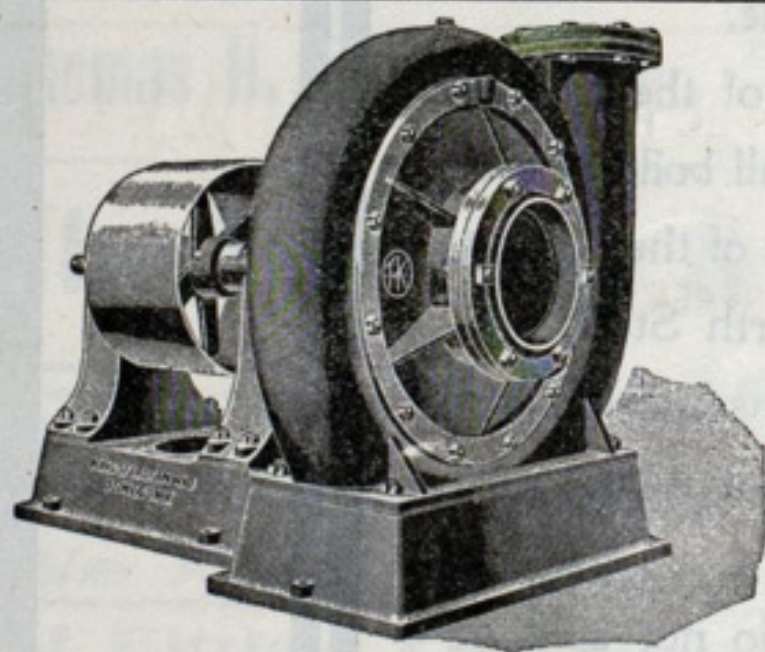


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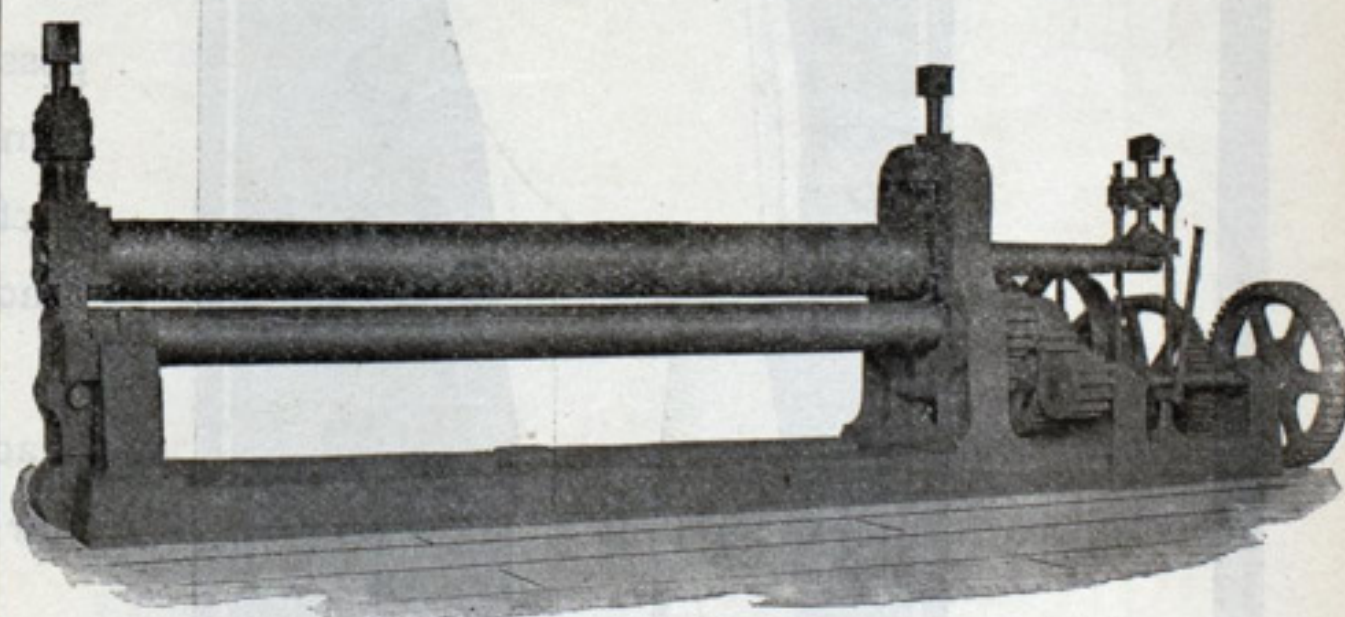


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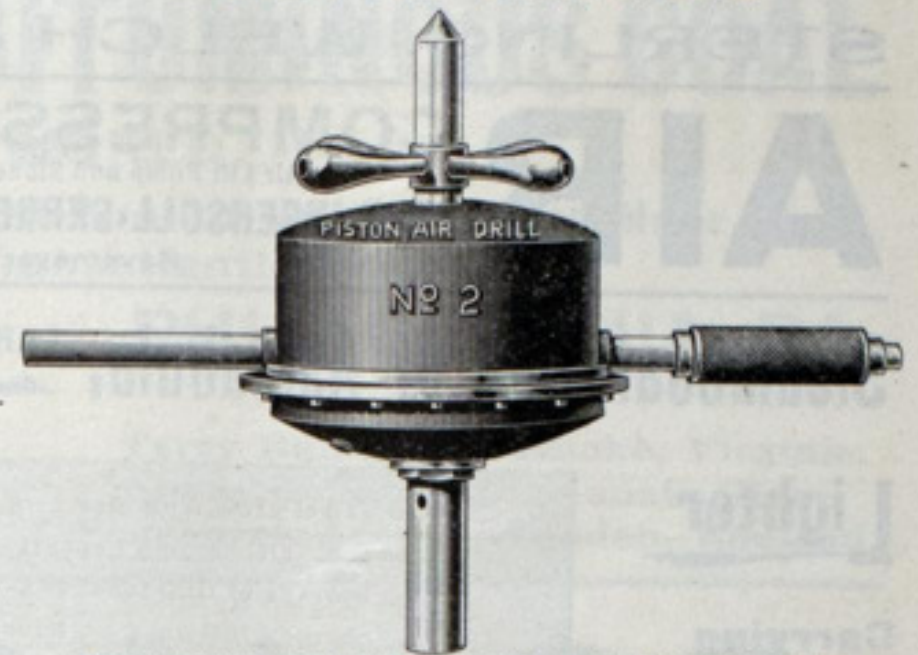
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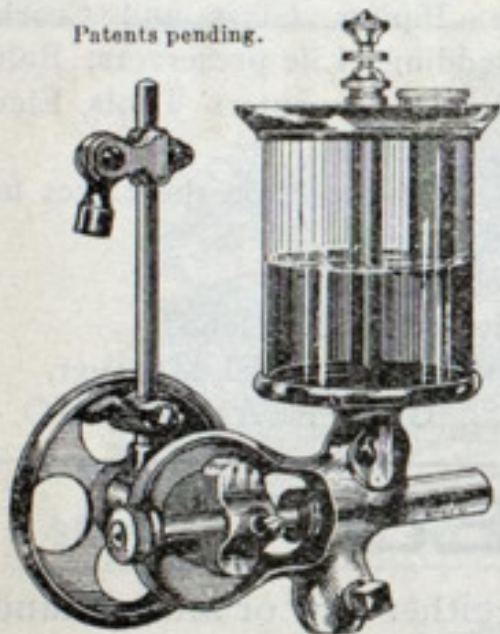
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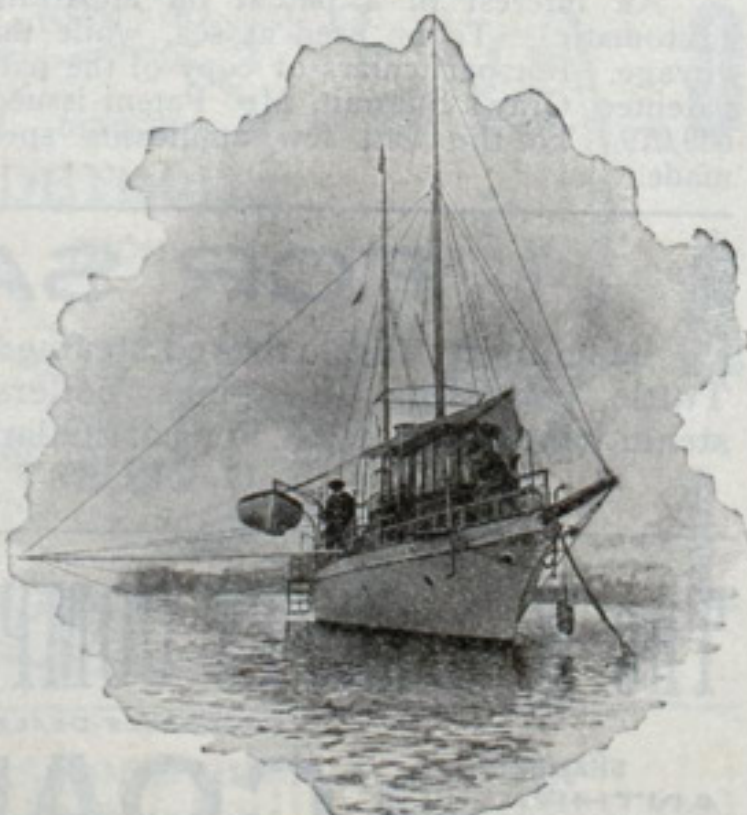
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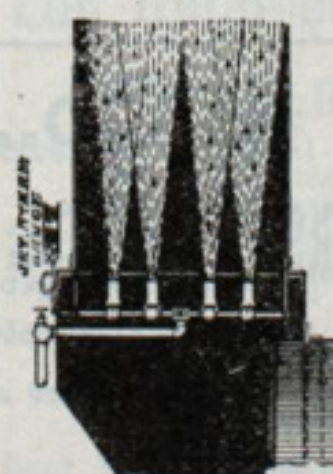
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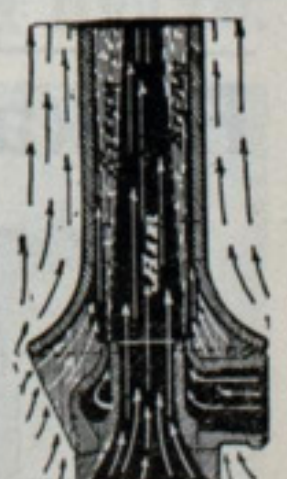


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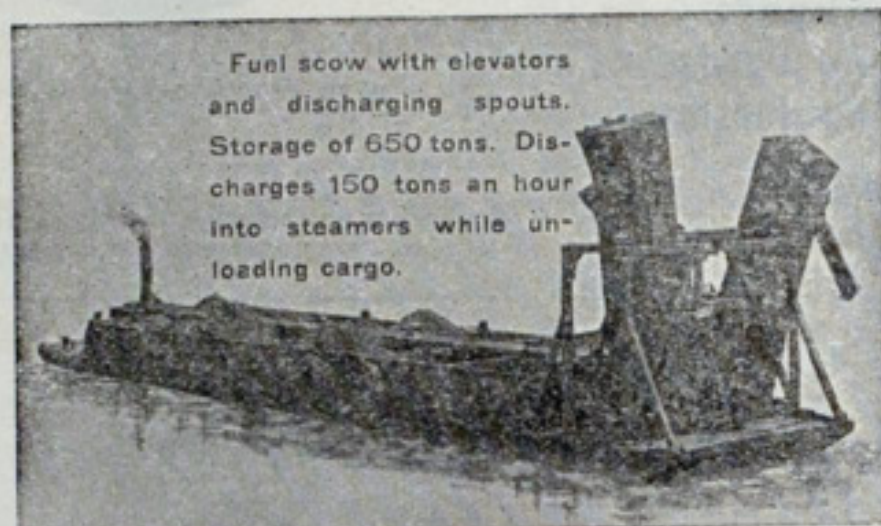
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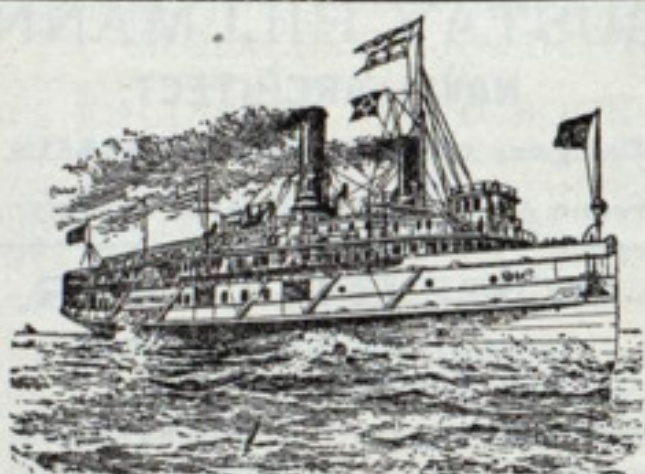
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Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson,
Engineer.....Philadelphia.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

FLUSHOMETERS.

Kenney, The Co.....New York.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
 Graham, James & Co..... Detroit.
 Hanna, M. A. & Co..... Cleveland.
 Pickands, Mather & Co..... Cleveland.
 Pittsburgh Coal Co..... Cleveland.
 Rochester & Pittsburgh Coal & Iron Co..... Buffalo.
 Smith, Stanley B. & Co..... Detroit.
 Scott Co., W. L..... Erie, Pa.
 Youghiogheny & Lehigh Coal Co..... Chicago.

GAS BUOYS.

Safety Car Heating & Lighting Co..... New York.

GAS AND GASOLINE ENGINES.

Giddings & Stevens..... Rockford, Ill.
 McMyler Mfg. Co..... Cleveland.
 Olds Motor Works..... Detroit.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co..... Boston.
 Ashton Valve Co..... Boston.
 Crosby Steam Gage & Valve Co..... Boston.

GRAPHITE.

Dixon Crucible Co., Joseph..... Jersey City, N. J.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co..... Chicago.
 Philadelphia Pneumatic Tool Co..... Philadelphia.
 Q. & C. Co..... Chicago.
 Standard Pneumatic Tool Co..... Chicago.

HAMMERS, POWER DROP.

Bement, Miles & Co..... Philadelphia.
 Chase Machine Co..... Cleveland.

HEATING APPARATUS.

Sturtevant Co., B. F..... Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co..... Cleveland.
 Brown Hoisting & Conveying Mach. Co..... Cleveland.
 Chase Machine Co..... Cleveland.
 Donohue & Co., John T..... Baltimore.
 Elwell-Parker Electric Co..... Cleveland.
 General Electric Co..... New York.
 Hodge, S. F. & Co..... Detroit.
 Hyde Windlass Co..... Bath, Me.
 Lidgerwood Mfg. Co..... New York.
 McMyler Mfg. Co..... Cleveland.
 Marine Iron Co..... Bay City.
 Sprague Electric Co..... New York.
 Westinghouse Electric & Mfg. Co..... Pittsburgh.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co..... Boston.
 Ashcroft Mfg. Co..... New York.
 Crosby Steam Gage & Valve Co..... Boston.

INJECTORS.

Jenkins Bros..... New York.
 Penberthy Injector Co..... Detroit.

INSURANCE, MARINE.

Brown & Co..... Buffalo.
 Drake & Maytham..... Buffalo.
 Elphicke, C. W. & Co..... Chicago.
 Gibbs & Joys..... Milwaukee.
 Hawgood & Moore..... Cleveland.
 Hutchinson & Co..... Cleveland.
 Keith, J. G. & Co..... Chicago.
 La Salle & Co..... Duluth.
 Mitchell & Co..... Cleveland.
 Myers, James A..... Chicago.
 Osborn & Co., F. H..... Chicago.
 Pauly, H. J..... Milwaukee.
 Parker & Miller..... Detroit.
 Peck, Chas. E. & W. F..... New York and Chicago.
 Richardson, W. C..... Cleveland.

IRON ORE AND PIG IRON.

Bourne-Fuller Co..... Cleveland.
 Hanna, M. A. & Co..... Cleveland.
 Pickands, Mather & Co..... Cleveland.

LATHES OF ALL KINDS.

American Tool Works Co. (The)..... Cincinnati.
 Bement, Miles & Co..... Philadelphia.
 Manning, Maxwell & Moore..... New York.

LAUNCHES—NAPHTHA, ELECTRIC.

Electric Boat Co..... New York.
 Gas Engine & Power Co..... New York.

LIFE BOATS—METALLIC.

Dreln, Thos. & Son..... Wilmington, Del.
 Kahnweiler's Sons, D..... New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co..... Pittsburgh.
 Dreln, Thos. & Son..... Wilmington, Del.
 Kahnweiler's Sons, D..... New York.
 Lane & DeGroot..... Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co..... Boston.

LUBRICATING PUMPS.

Manzel Bros..... Buffalo.
 Phenix Metallic Packing Co..... Chicago.
 Sterling Lubricator Co..... Rochester, N. Y.

MACHINE TOOLS.

American Tool Works Co. (The)..... Cincinnati.
 Bement, Miles & Co..... Philadelphia.

MACHINE TOOLS (WOOD WORKING).

Egan Co., The..... Cincinnati.
 Fay, J. A. & Co..... Cincinnati.
 Woods Machine Co., S. A..... So. Boston.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W..... New York.
 Mechanical Fabric Co..... Providence, R. I.

METALLIC PACKING.

Katzenstein, L. & Co..... New York.
 Phenix Metallic Packing Co..... Chicago.
 U. S. Metallic Packing Co..... Philadelphia.

METALS FOR BEARINGS.

Ajax Metal Co..... Philadelphia.
 Cramp, Wm. & Sons..... Philadelphia.
 Illinois Smelting & Refining Works..... Chicago.
 Magnolia Metal Co..... New York.
 Phosphor Bronze Smelting Co., Ltd..... Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co..... Boston, Mass.

MILLING MACHINES OF ALL KINDS.

American Tool Works Co. (The)..... Cincinnati.
 Bement, Miles & Co..... Philadelphia.

NAUTICAL INSTRUMENTS.

Bliss, John & Co..... New York.
 Ritchie & Sons, E. S..... Brookline, Mass.

NAVAL ARCHITECTS.

Curr, Robert..... Cleveland.
 Hillman, Gustav..... Brooklyn.
 See, Horace..... New York.
 Wood, W. J..... Chicago.

NICKEL STEEL FORGINGS.

Bethlehem Steel Co..... So. Bethlehem, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Jos..... Jersey City, N. J.
 Standard Oil Co..... Cleveland.

PACKING.

Jenkins Bros..... New York.
 Katzenstein, L. & Co..... New York.
 Phenix Metallic Packing Co..... Chicago.
 U. S. Metallic Packing Co..... Philadelphia.

PAINTS.

Baker, Howard H. & Co..... Buffalo.
 Smith, Edward & Co..... New York.
 Upson-Walton Co..... Cleveland.

PAINTING MACHINES, PNEUMATIC.

Chicago Pneumatic Tool Co..... Chicago.

PATENT ATTORNEYS.

Thurston & Bates..... Cleveland.

PATTERN SHOP MACHINERY.

Egan Co., The..... Cincinnati.
 Fay, J. A. & Co..... Cincinnati.
 Woods Machine Co., S. A..... So. Boston.

PIPE, WROUGHT IRON.

Bourne-Fuller Co..... Cleveland.

PLANERS OF ALL KINDS.

American Tool Works Co. (The)..... Cincinnati.
 Bement, Miles & Co..... Philadelphia.

PLANING MILL MACHINERY.

Egan Co., The..... Cincinnati.
 Fay, J. A. & Co..... Cincinnati.
 Woods Machine Co., S. A..... So. Boston.

PLUMBING, MARINE.

Ellis Marine Plumbing Co..... New York.
 Mott Iron Works, J. L..... New York.
 Sands, Alfred B. & Son..... New York.
 Kenney, The Co..... New York.

PNEUMATIC TOOLS.

Chicago Pneumatic Tool Co..... Chicago.
 Philadelphia Pneumatic Tool Co..... Philadelphia.
 Q. & C. Co..... Chicago.
 Standard Pneumatic Tool Co..... Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co..... Boston, Mass.

PROPELLER WHEELS.

American Ship Building Co..... Cleveland.
 Atlantic Works..... East Boston, Mass.
 Bath Iron Works Ltd..... Bath, Me.
 Case, A. Wells & Son..... Highland Park, Conn.
 Cramp, Wm. & Sons..... Philadelphia.
 Detroit Shipbuilding Co..... Detroit.
 Farrar & Trefts..... Buffalo.
 Fore River Engine Co..... Weymouth, Mass.
 Hardy, John B..... Tacoma, Wash.
 Hyde Windlass Co..... Bath, Me.
 Harlan & Hollingsworth Co..... Wilmington, Del.
 Hodge, S. F. & Co..... Detroit.
 Jenks Ship Building Co..... Port Huron, Mich.
 MacKinnon Mfg Co..... Bay City, Mich.
 Maryland Steel Co..... Sparrow's Point, Md.
 Moran Bros. Co..... Seattle, Wash.
 Morse Iron Works & Dry Dock Co..... Brooklyn.
 Neafie & Levy Ship & Eng. Bldg Co..... Philadelphia.
 Newport News Ship Bldg. Co..... Newport News, Va.
 Nixon, Lewis..... Elizabeth, N. J.
 Phosphor Bronze Smelting Co., Ltd..... Philadelphia.
 Pusey & Jones Co..... Wilmington, Del.
 Risdon Iron Works..... San Francisco.
 Sheriffs Mfg. Co..... Milwaukee.
 Trigg, Wm. R. Co..... Richmond, Va.
 Trout, H. G..... Buffalo.
 Union Iron Works..... San Francisco.
 Wolff & Zwicker Iron Works..... Portland, Ore.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co..... Cleveland.
 General Electric Co..... Schenectady, N. Y.
 Rushmore Dynamo Works..... Jersey City, N. J.
 Sprague Electric Co..... New York.
 Westinghouse Electric & Mfg. Co..... Pittsburgh, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co..... New York.
 Davidson, M. T..... Brooklyn, N. Y.
 Donohue & Co., John T..... Baltimore.
 Kingsford Foundry & Machine Works.....
 ..Oswego, N. Y.
 Van Duzen, The E. W. Co..... Cincinnati.
 Worthington, Henry R..... New York.

PUNCHES, RIVETERS, SHEARS.

American Tool Works Co. (The)..... Cincinnati.
 Bement, Miles & Co..... Philadelphia.
 Cleveland Punch & Shear Works Co..... Cleveland.
 Long & Allstatter Co..... Cincinnati.
 New Doty Mfg. Co..... Janesville, Wis.
 Wood & Co., R. D..... Philadelphia.

RANGES, KITCHEN OUTFITS.

Born Steel Range & Mfg. Co..... Cleveland.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register..... Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
 Standard Aut. Releasing Hook Co..... New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co..... Cleveland.
 Champion Rivet Co..... Cleveland.

RUBBER INSULATED WIRES.

Roebbing's Sons, John A..... New York and Cleveland.

SAFETY VALVES.

American Steam Gauge Co..... Boston.
 Ashton Valve Co..... Boston.
 Crosby Steam Gage & Valve Co..... Boston.

SAIL MAKERS.

Baker, Howard H. & Co..... Buffalo.
 Upson-Walton Co..... Cleveland.
 Wilson & Silsby..... Boston.

SALVAGE COMPANIES.

See wrecking companies.

SCREW MACHINES.

American Tool Works Co. (The)..... Cincinnati.
 Bement, Miles & Co..... Philadelphia.

SEARCH LIGHTS.

Elwell-Parker Electric Co..... Cleveland.
 General Electric Co..... Schenectady, N. Y.
 Rushmore Dynamo Works..... Jersey City, N. J.
 Sprague Electric Co..... New York.
 Westinghouse Electric & Mfg. Co..... Pittsburgh, Pa.

SEPARATORS, (CENTRIFUGAL).

Keystone Engine & Machine Works, W. L. Simpson,
 Engineer..... Philadelphia.

SHAPERS.

American Tool Works Co. (The)..... Cincinnati.

SHEARS.

See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co..... Cleveland.

SHIP BUILDERS.

American Ship Building Co..... Cleveland.
 Atlantic Works..... East Boston, Mass.
 Bath Iron Works Ltd..... Bath, Me.
 Cramp, Wm. & Sons..... Philadelphia.
 Craig Ship Building Co..... Toledo, O.
 Chicago Ship Building Co..... Chicago.
 Detroit Shipbuilding Co..... Detroit.
 Fore River Engine Co..... Weymouth, Mass.
 Hardy, John B..... Tacoma, Wash.
 Harlan & Hollingsworth Co..... Wilmington, Del.
 Iowa Iron Works..... Dubuque, Ia.
 Jenks Ship Building Co..... Port Huron, Mich.
 Maryland Steel Co..... Sparrow's Point, Md.
 Moran Bros. Co..... Seattle, Wash.
 Morse Iron Works & Dry Dock Co..... Brooklyn.
 Neafie & Levy Ship & Eng. Bldg Co..... Philadelphia.
 Newport News Ship Bldg. Co..... Newport News, Va.
 Nixon, Lewis..... Elizabeth, N. J.
 Pusey & Jones Co..... Wilmington, Del.
 Risdon Iron Works..... San Francisco.
 Roach's Ship Yard..... Chester, Pa.
 Townsend & Downey Ship Bldg. Co..... New York.
 Trigg, Wm. R. Co..... Richmond, Va.
 Union Dry Dock Co..... Buffalo.
 Union Iron Works..... San Francisco.
 Wolff & Zwicker Iron Works..... Portland, Ore.

SHIP CHANDLERS.

Baker, Howard H. & Co..... Buffalo.
 Marine Supply Co..... Fairport Harbor, O.
 Moran, Bros. Co..... Seattle, Wash.
 Upson-Walton Co..... Cleveland.

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Patriarche, H. R..... Milwaukee.

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Moran Bros. Co..... Seattle, Wash.

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American Ship Building Co.	1	Dearborn Drug & Chemical Works.	30			Red Star Line.	7
American Ship Windlass Co.	2	Delaware River Iron S. B. & E. Works	5			Richardson, W. C.	31
American Steam Gauge Co.	1	Dixon, Jos., Crucible Co.	9	Lane & DeGroot.	28	Risdon Iron Works.	5
American Steel & Wire Co.	1	Donnelly Salvage & Wrecking Co.	32	*Learmonth, Robert.	30	*Ritchie & Sons, E. S.	30
American Stoker Co.	3	Donohue & Co, John T.	40	Lebanon Chain Works.	5	Roach's Ship Yard.	5
American Tool Works Co.	24	Drake & Maytham.	34	Long & Allstatter Co.	26	Roberts Water Tube Boiler Co.	11
Armstrong Cork Co.	40	Drein, Thos. & Son.	28	Lidgerwood Mfg. Co.	6	Rochester & Pittsburgh Coal & Iron Co.	33
Ashton Valve Co.	12			L. S. & M. S. Ry.	39	*Roebbling's, John A. Sons Co.	9
Atlantic Works	5	Egan Co., The.	7			Rushmore Dynamo Works.	9
Atlantic Tube Co.	8	Electric Boat Co.	8				
		Ellis Marine Plumbing Co.	7	McMyler Mfg. Co.	4	Safety Car Heating & Lighting Co.	31
Babcock & Wilcox Co.	11	Elphicke, C. W. & Co.	34	*Magnolia Metal Co.	1	Sands, Alfred B. & Son.	10
Baldt Anchor Co.	9	Ellwell-Parker Electric Co.	2	Mackinnon Mfg. Co.	8	Scherzer Rolling Lift Bridge Co.	6
Ball Bearing Co., Boston, Mass.	1	Erie & Western Trans. Co.	32	Mair, John & Son.	6	Scott Co., W. L.	32
Baker, Howard H. & Co.	9			Manzel Bros.	31	See, Horace.	34
Bath Iron Works, Ltd.	1	Falls Hollow Staybolt Co.	4	Marine Iron Co.	4	Shelby Steel Tube Co.	29
Bement, Miles & Co.	10	Farrar & Trefts.	5	Marine Supply Co.	31	Sheriffs Mfg. Co.	10
Berlin Iron Bridge Co.	6	Fay, J. A. & Co.	7	Martin-Barriss Co.	9	Simpson, Geo. A.	28
Bertram's Oil Polish Co.	1	Fletcher, W. & A. Co.	4	Maryland Steel Co.	5	Smith, Edward & Co.	1
Bessemer Steamship Co.	32	Fore River Engine Co.	5	Mechanical Fabric Co.	2	Smith, Stanley B. & Co.	33
Bethlehem Steel Co.	6	Fogg, M. W.	31	Miller, Walter.	9	Sprague Electric Co.	3
Big Four Railway.	39	Gas Engine & Power Co. and Chas. L.		Mitchell & Co.	34	Standard Chain Co.	10
Blake, Geo. F., Mngf. Co.	9	Seabury & Co., Consolidated.	31	Moffat & O'Brien.	34	Standard Oil Co.	27
*Bliss, John & Co.	30	General Electric Co.	6	Monongahela Iron & Steel Co.	3	Standard Releasing Hook Co.	4
*Bloomsburg & Co., H.	31	Gibbs & Joys.	34	*Moran Bros. Co.	39	*Standard Pneumatic Tool Co.	26
Boland, J. J.	34	Giddings & Stevens.	4	Morse Iron Works & Dry Dock Co.	4	Sterling Lubricator Co.	8
Born Steel Range & Mngf. Co.	28	Gilchrist, Albert J.	34	Morse, Williams & Co.	9	Sterling, Welch & Co.	32
*Boston & Lockport Block Co.	34	Goulder, Harvey D.	34	Mott Iron Works, J. L.	10	Stirling Co.	10
*Boyer Water Tube Boiler Co.	31	Graham, James & Co.	33	Myers, James A.	34	Sturtevant, B. F. Co.	40
Bourne-Fuller Co.	12	Great Lakes Register.	7			Swain Wrecking Co.	32
Brown & Co.	34			Neafie & Levy Co.	5	Thurston & Bates.	34
Brown Hoisting & Conveying Mach. Co.	2	Hall & Root.	34	Newport News Ship Building & Dry		Townsend & Downey Ship Bldg. Co.	4
Buffalo Forge Co.	12	Hall Compound Feeder Co.	8	Dock Co.	5	Trigg Co., Wm. R.	4
Bull & Co., A. H.	34	Hanna, M. A. & Co.	32	New Doty Mfg. Co.	12	Trout, H. G.	9
		Hardy, John H.	4	Nixon, Lewis.	5		
Calvin Co., The.	1	Harlan & Hollingsworth Co., The.	5	North River Iron Works.	5	Union Dry Dock Co.	7
Case, A. Wells & Son.	28	Hawgood & Moore.	34			Union Iron Works.	5
Castner, Curran & Bullitt.	3	Herriman, F. D.	7	Olds Motor Works.	8	Upson-Walton Co.	40
Champion Rivet Co.	28	Hillman, Gustav.	34	Osborne & Co., F. H.	34	U. S. Metallic Packing Co.	40
Chase Machine Co.	6	Hodge, S. F. & Co.	8				
Chelsea Clock Co.	39	Holmes, Samuel.	34	Page Bros. & Co.	3	Warren Webster & Co.	10
Chicago Pneumatic Tool Co.	31	Hoyt, Dustin & Kelley.	34	Parker & Millen.	32	Webster, Camp & Lane Machine Co.	3
Chicago Ship Building Co.	2	Hungerford Brass & Copper Co., U. T.	3	Pauly, H. J.	34	Westinghouse Electric & Mfg. Co.	6
*Cleveland Punch & Shear Works Co.	30	Hunt, Robert W. & Co.	34	Patriarche, H. R.	12	White, Johnson, McCaslin & Cannon.	34
C. C. C. & St. L. R. R.	39	Hutchinson & Co.	34	Peck, Chas. E. & W. F.	7	Williams & Rogers Co.	28
Conners, W. J.	34	Hyde Windlass Co.	40	*Penberthy Injector Co.	39	Wilson, Thomas.	34
Cole & Kuhls.	7			Phenix Metallic Packing Co.	8	Wilson & Slisby.	6
Continental Iron Works.	2	Illinois Smelting & Refining Works.	40	Philadelphia Pneumatic Tool Co.	10	Wolf & Zwicker Iron Works.	5
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*Craig Ship Building Co.	30	International Anchor Co.	9	Pickands, Mather & Co.	32	*Wood & Co., R. D.	30
Cramp, Wm., & Sons, S. & E. B. Co.	1	International Navigation Co.	7	Pinney, Orestes C.	34	Woods Machine Co., S. A.	8
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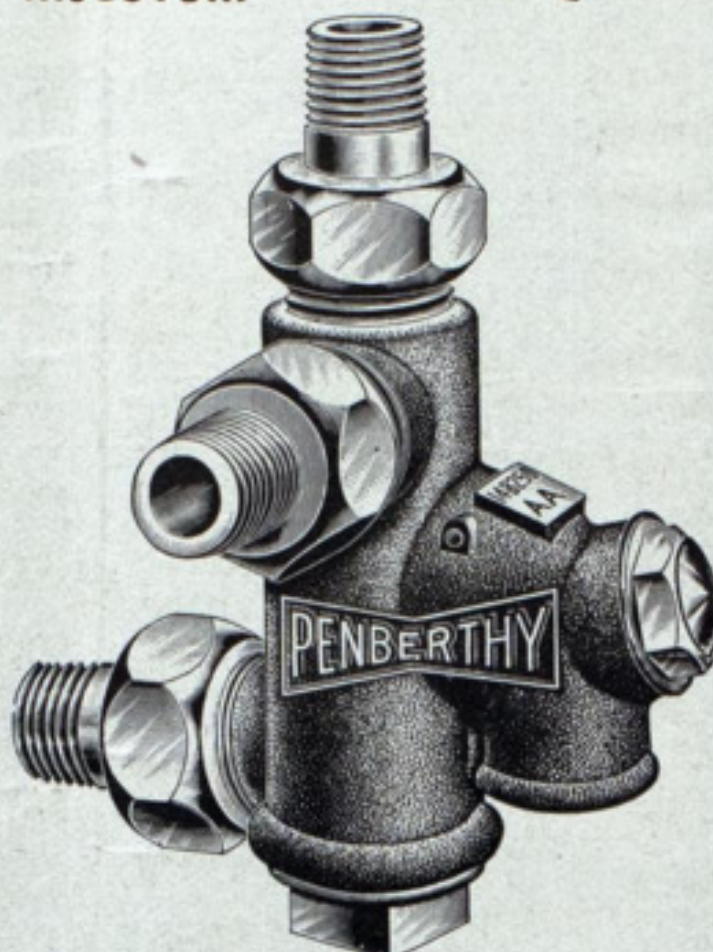
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No. 16, New England Express.....		*10 30 pm	*10 35 pm
No. 2, Day Express		†9 05 pm	†9 20 pm
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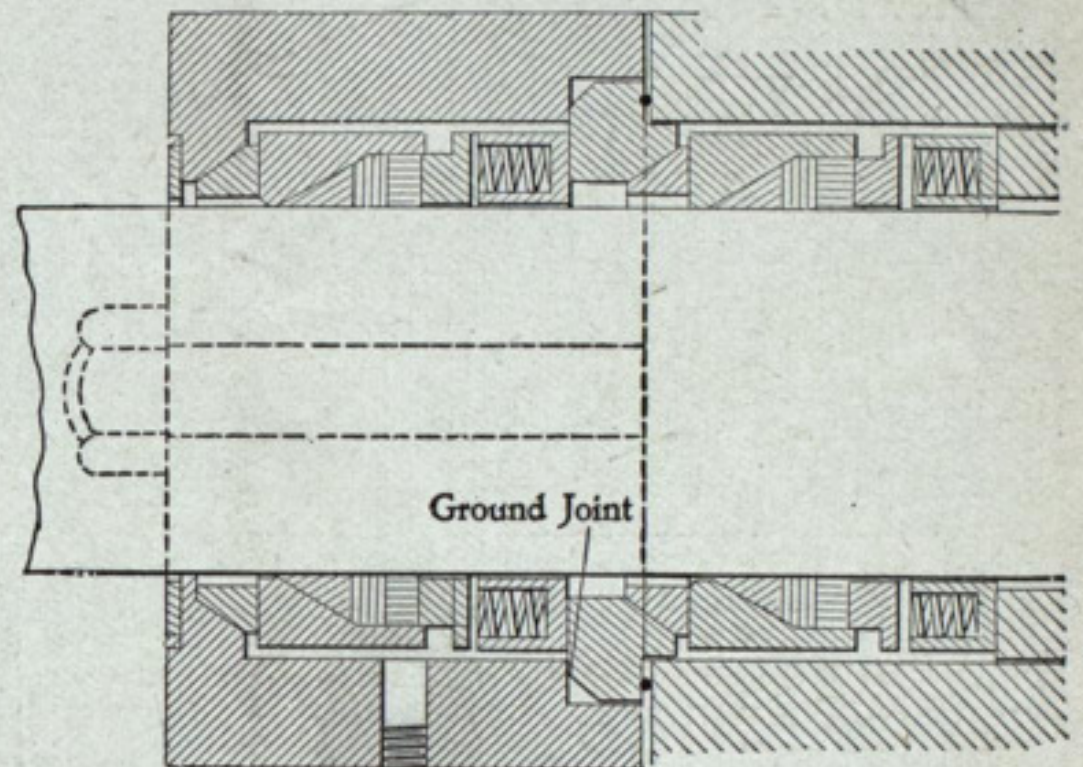
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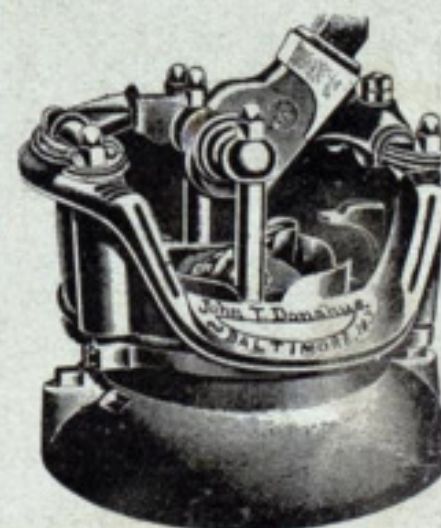
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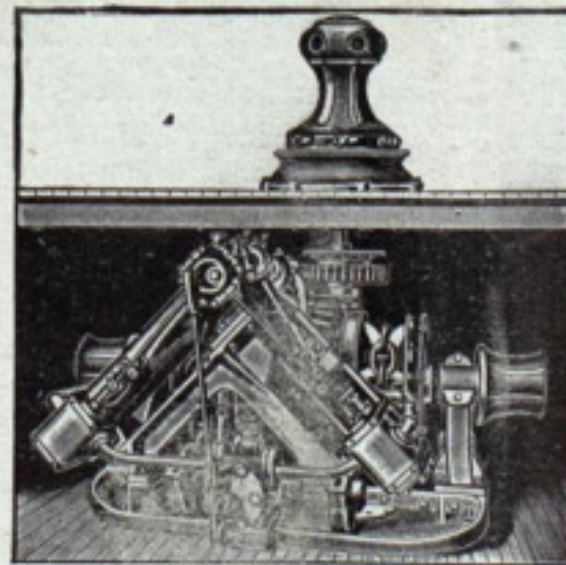
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No. 20



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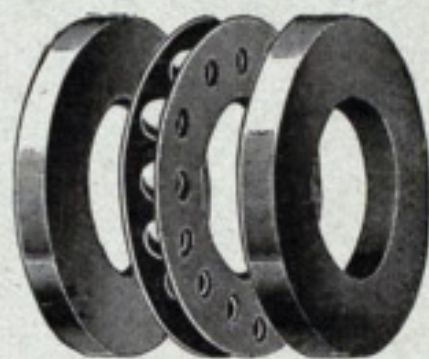
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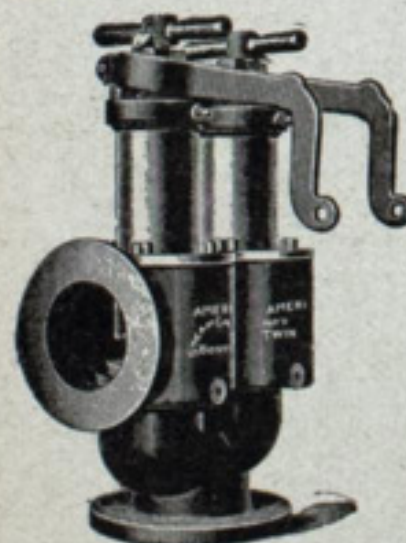
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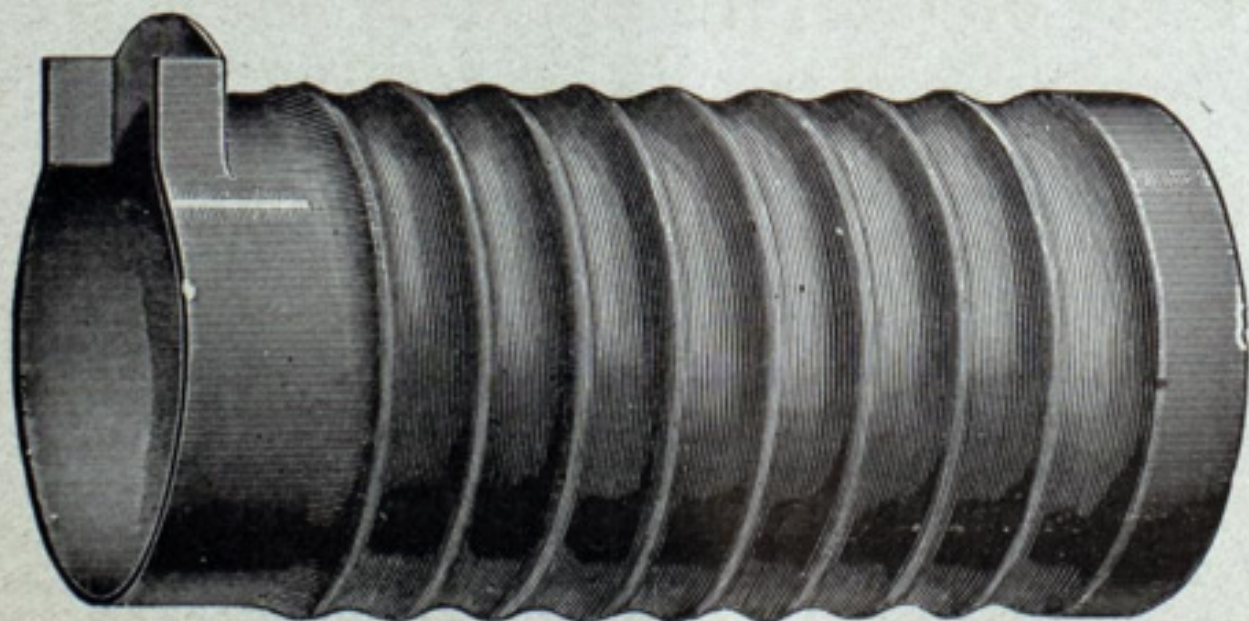
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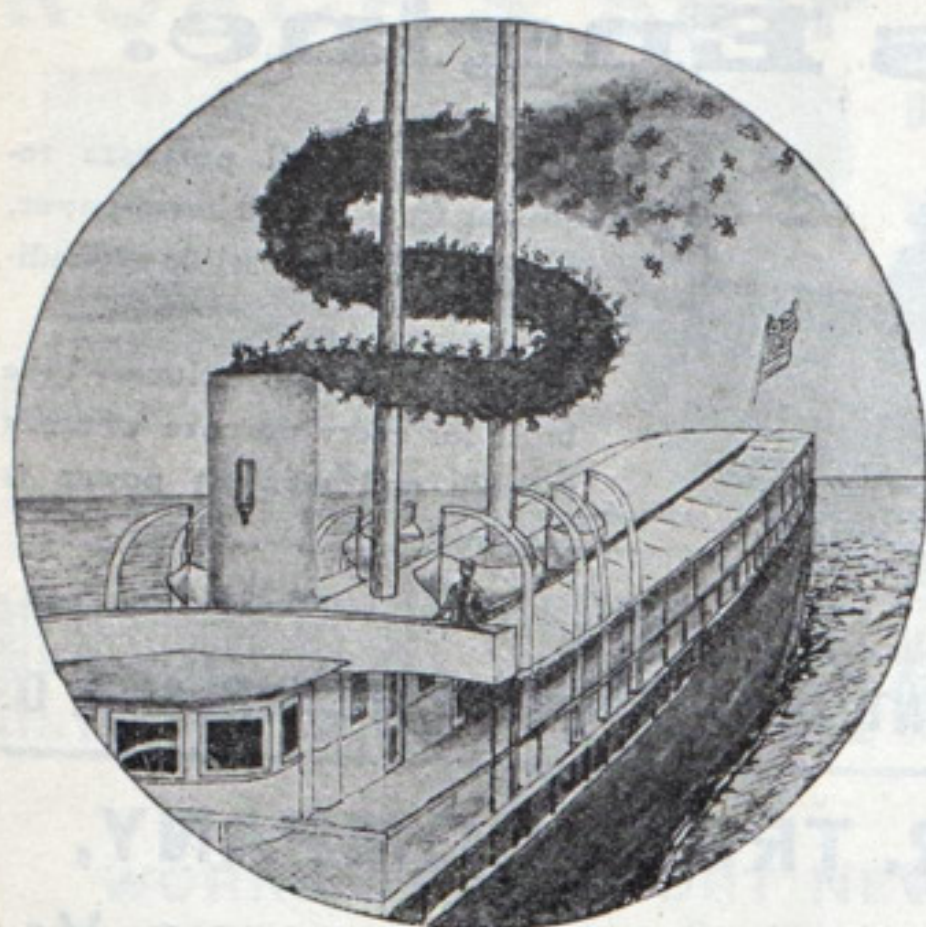
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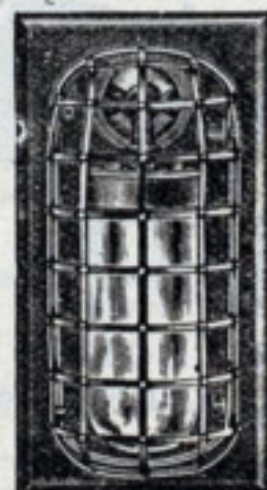
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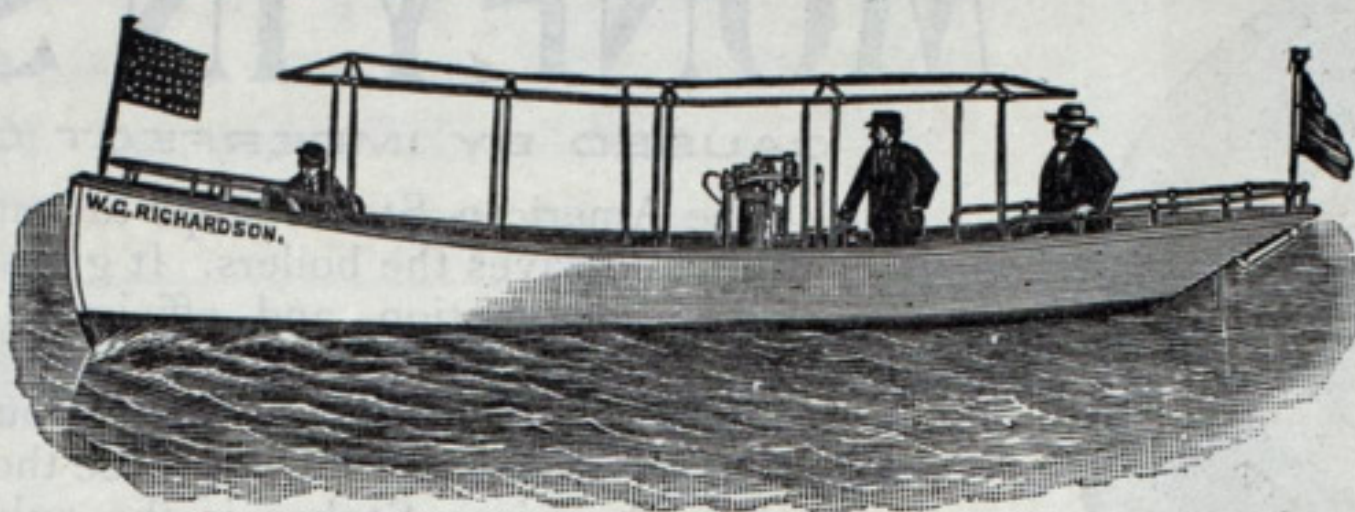
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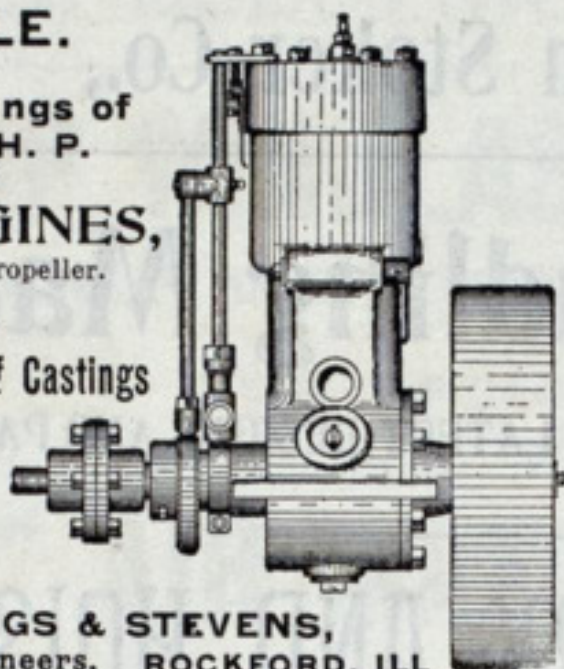
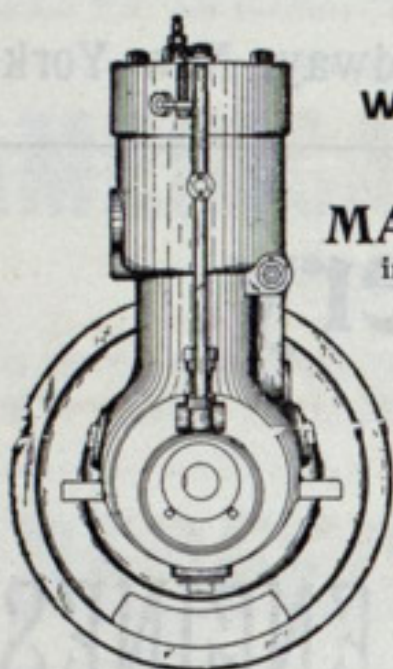
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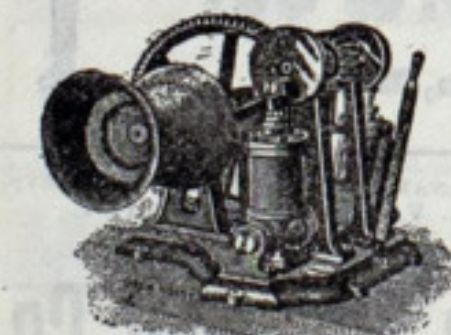


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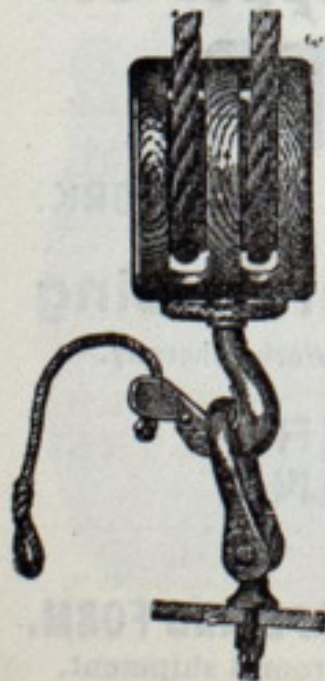
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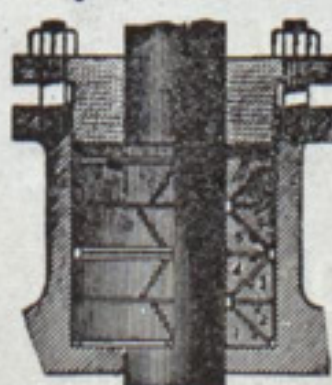
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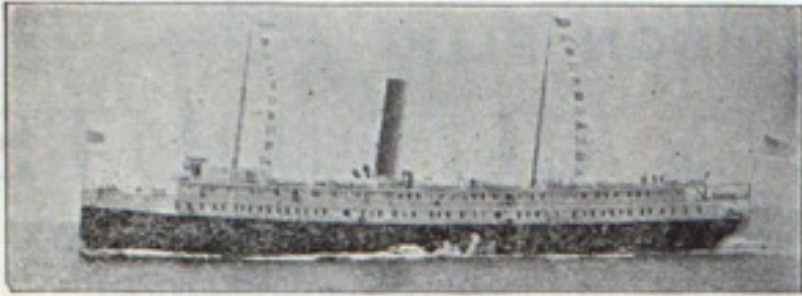
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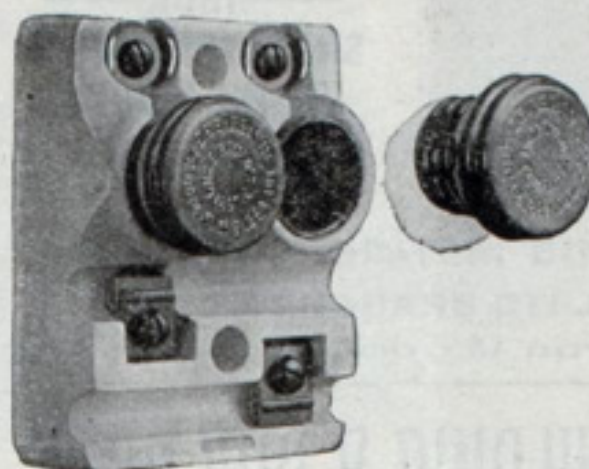
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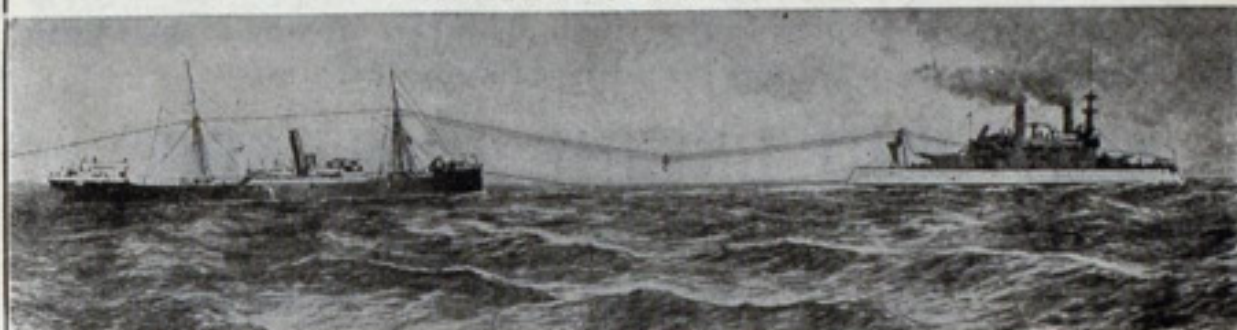
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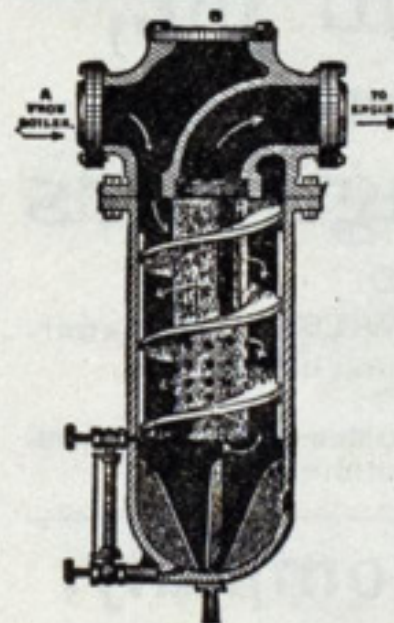
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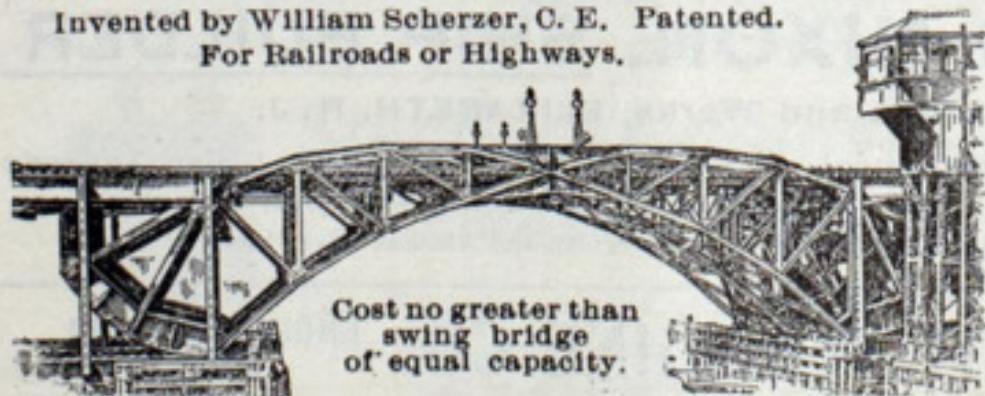
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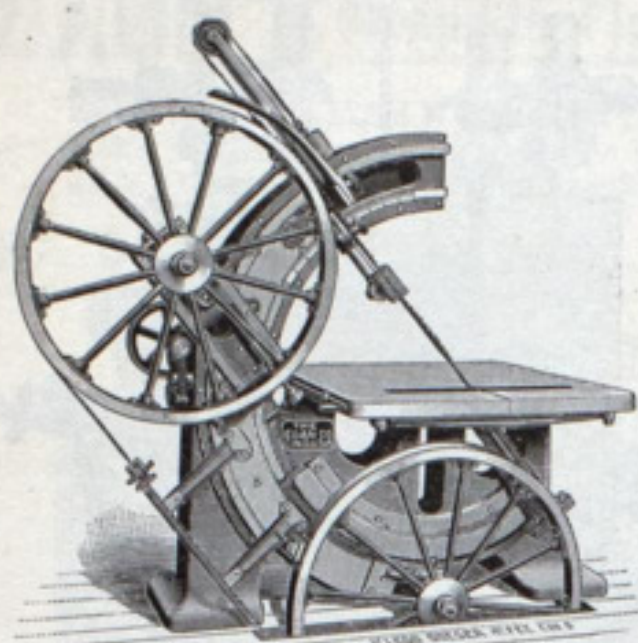
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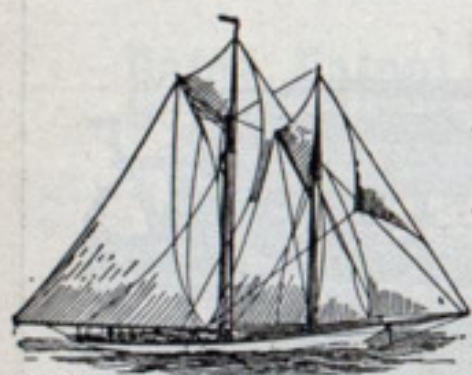
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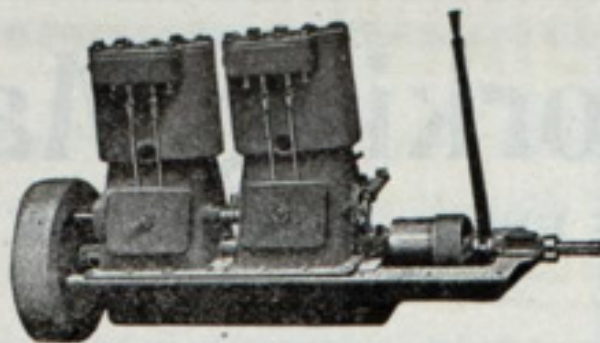
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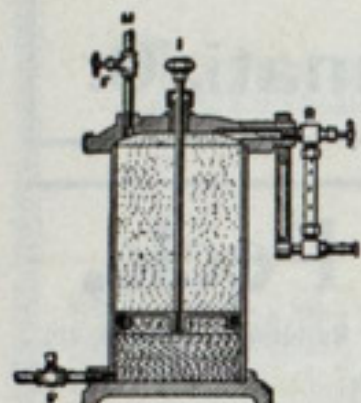
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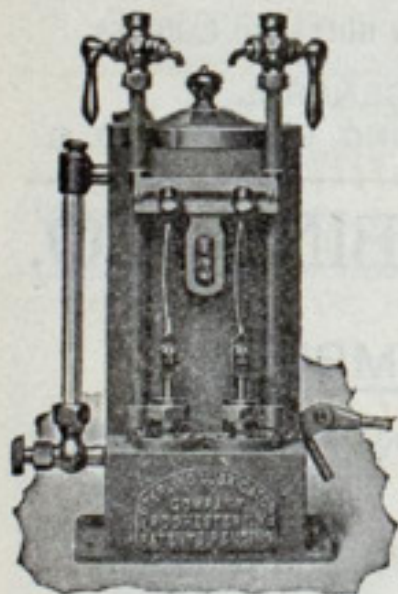
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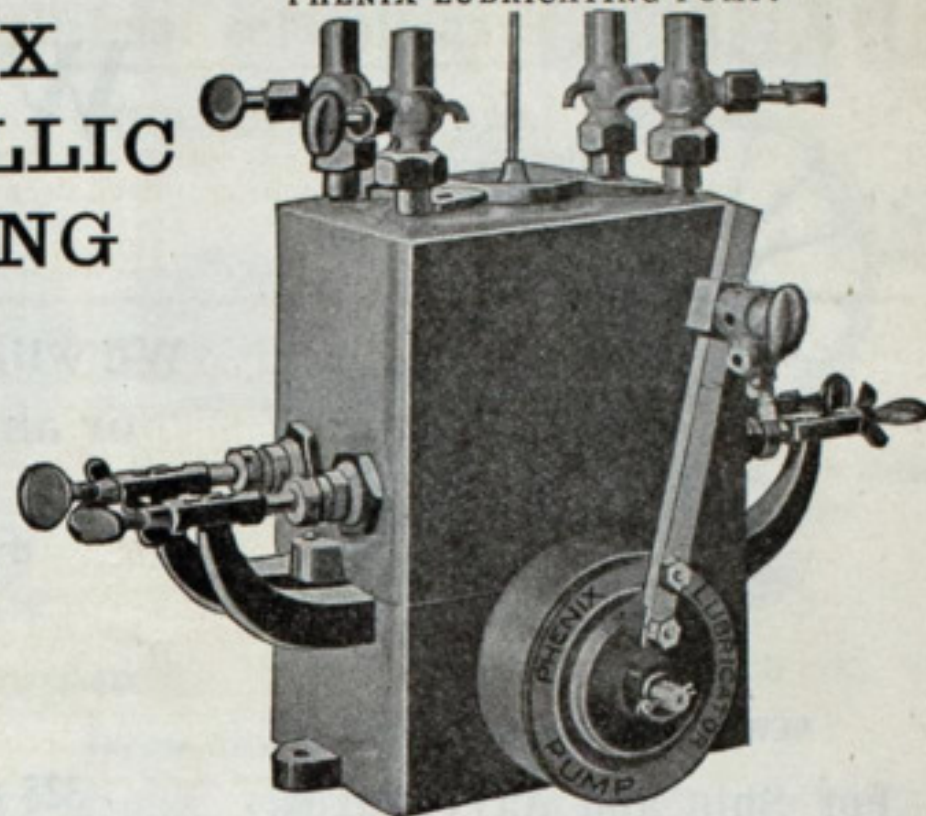
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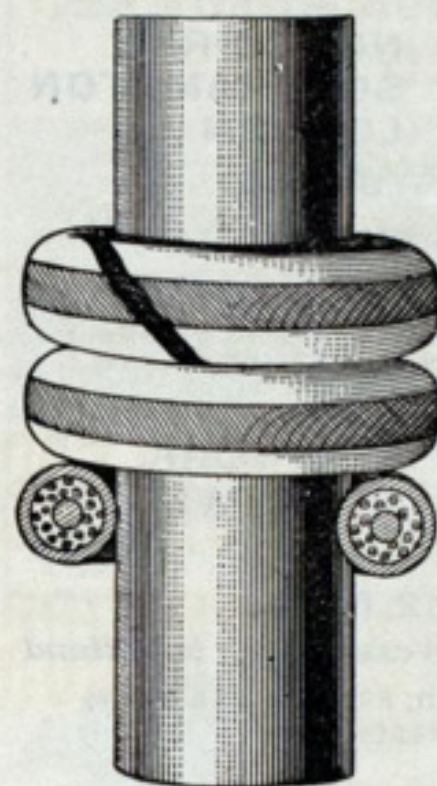
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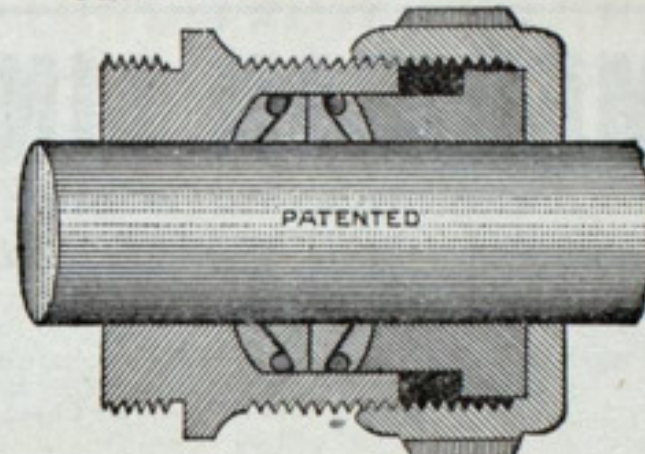


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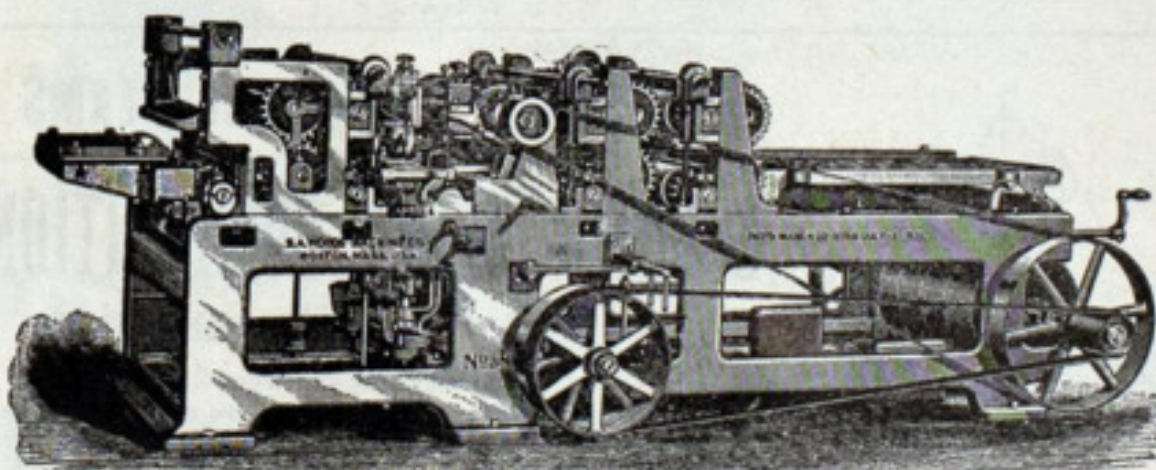
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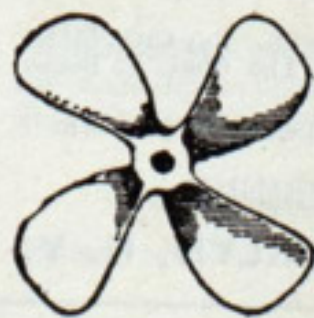
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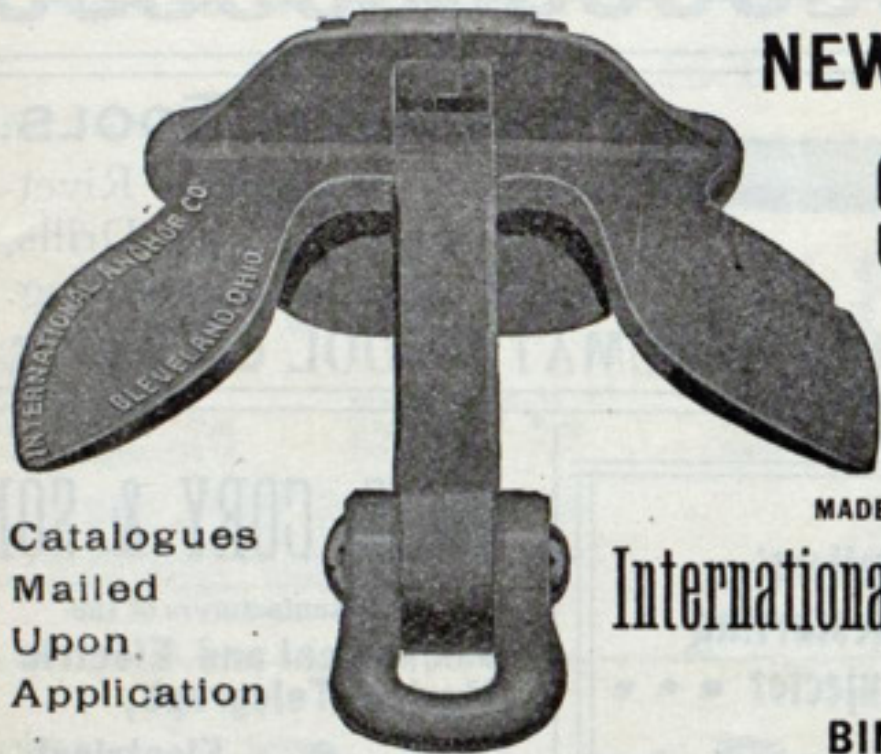
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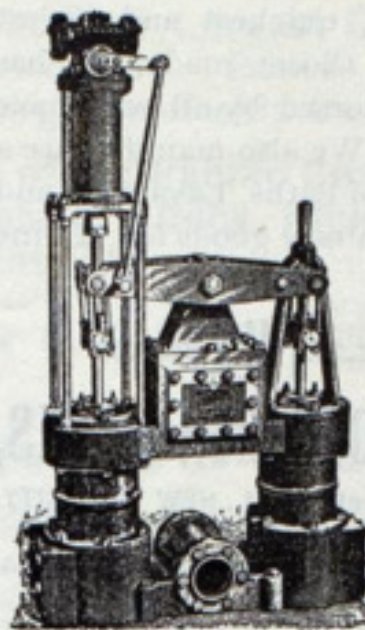
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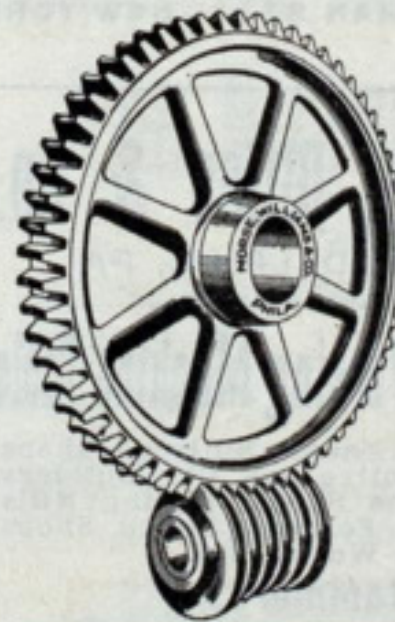
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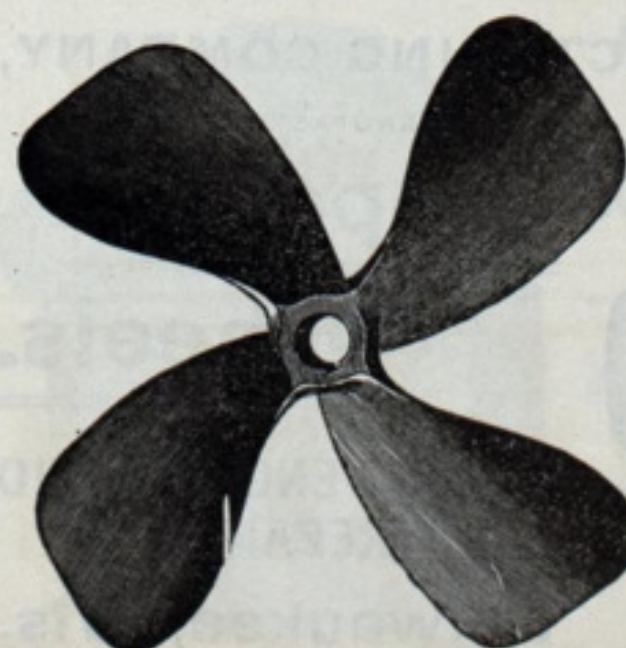
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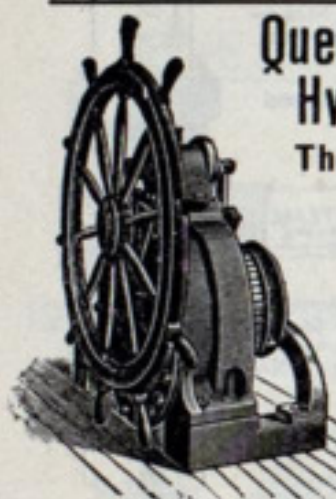
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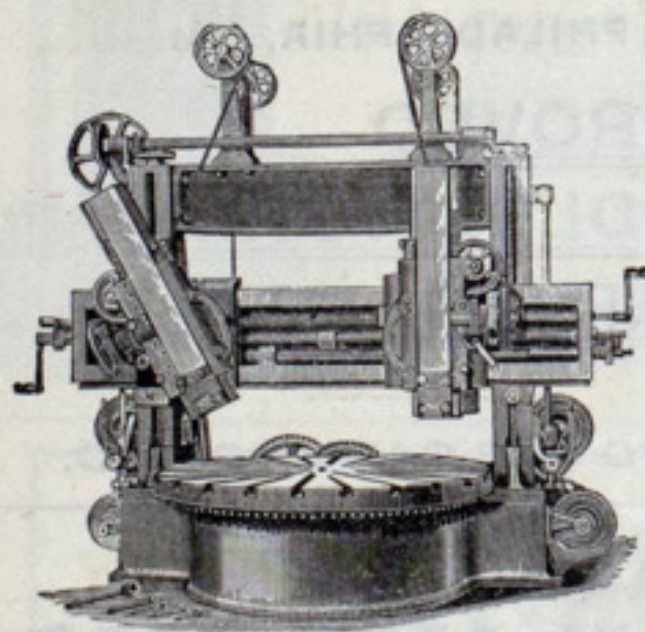
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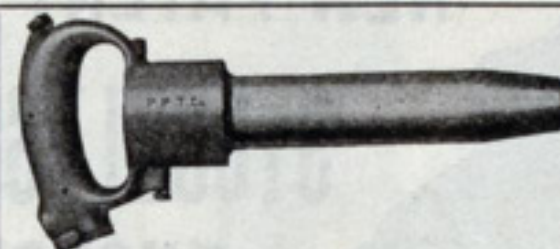
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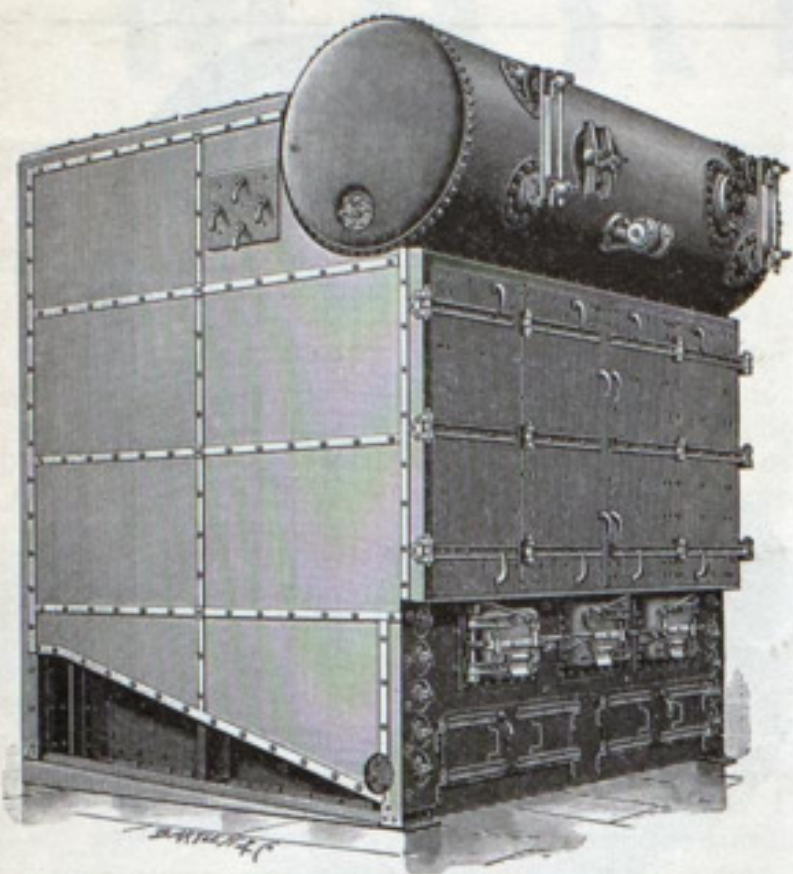
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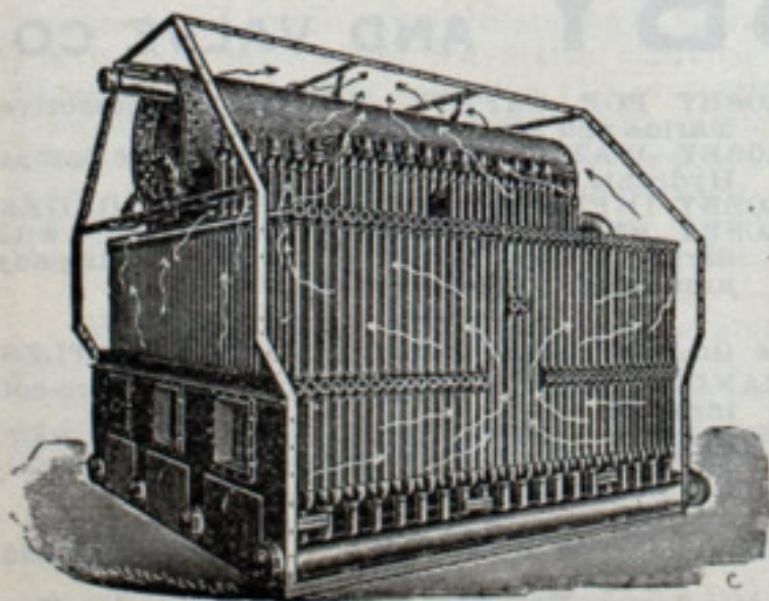
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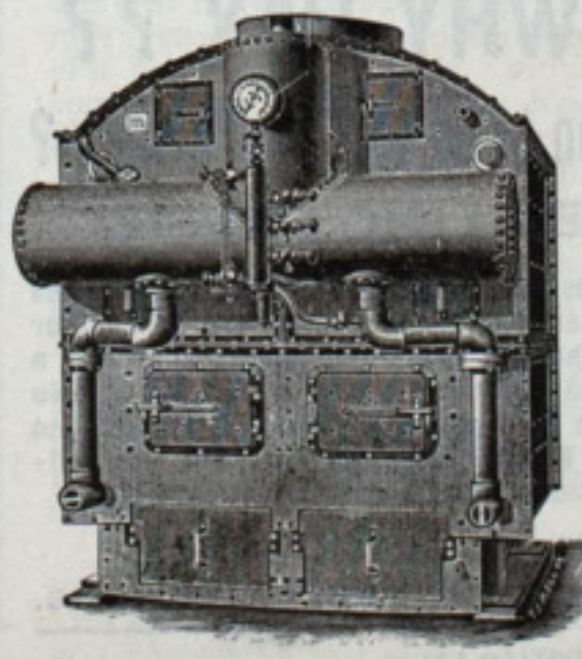
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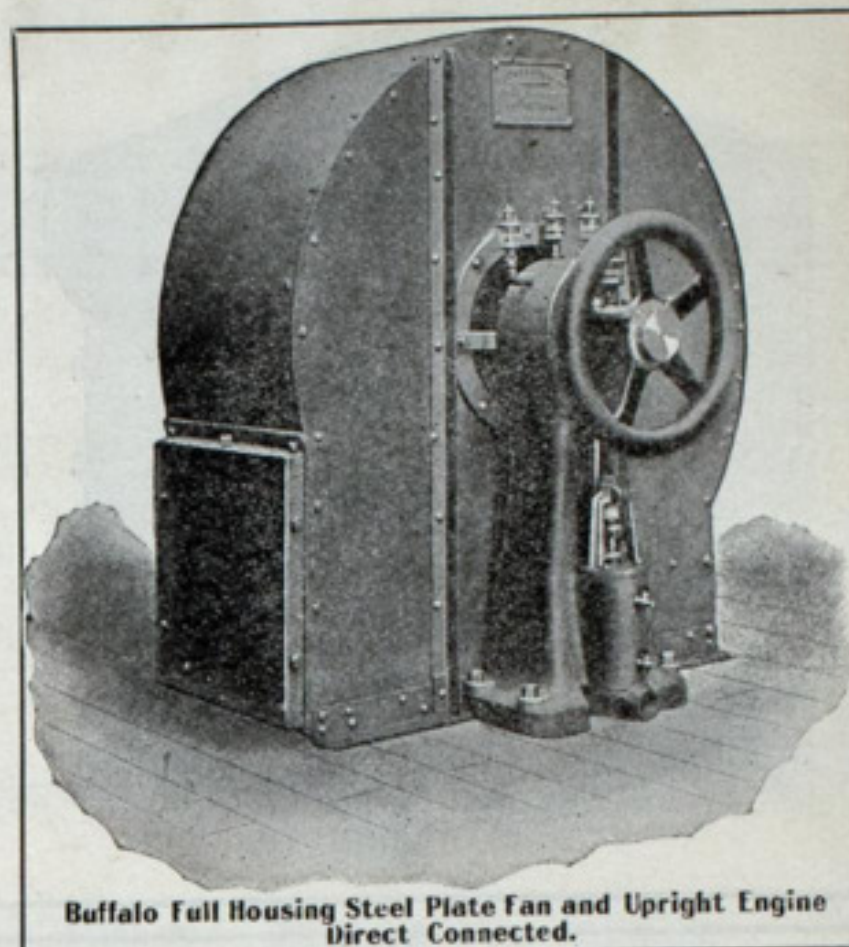
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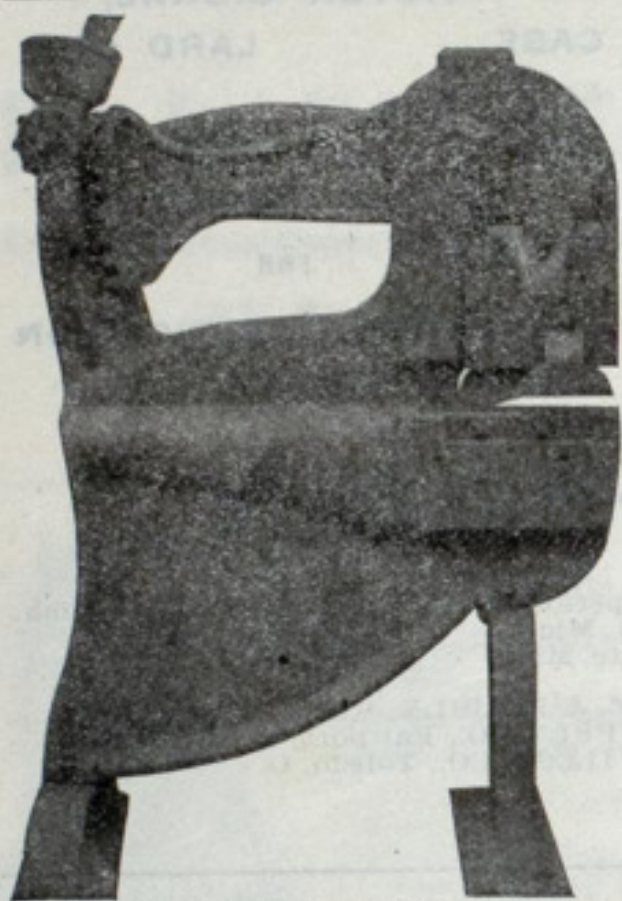
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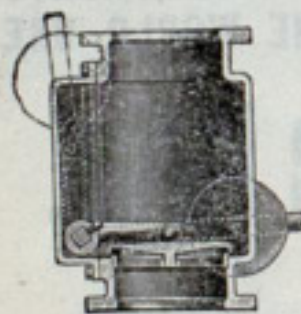


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The illustration shows a machine designed especially for cutting sheet metal. It is a continuous shear made in three sizes. The cut shows the largest size, the No. 4 B. The smallest size cuts up to 3-16-inch sheets, the next size to 5-16, and the machine shown cuts up to 1/2-inch sheets. They all cut sheets of any width or any length. These machines are shipped complete and ready for use. They are made especially for the use of boiler makers and sheet metal workers. The two larger sizes can also be supplied with a special attachment for beveling sheets.

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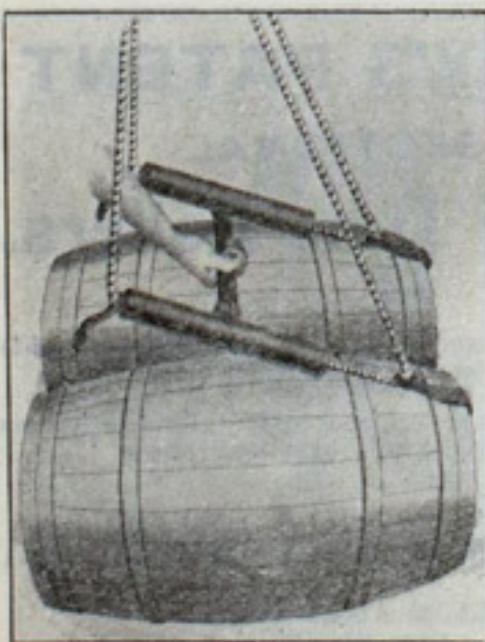
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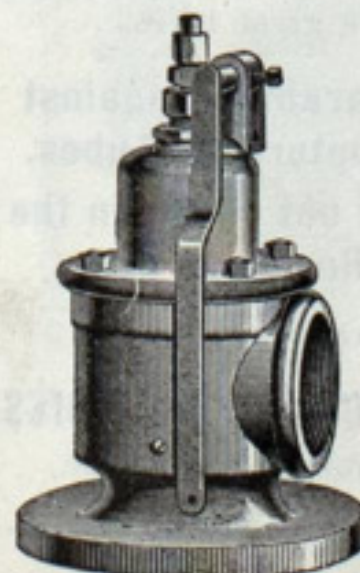
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